Conference Proceedings

University of Tehran
Aras Intl. Campus

3rd International Conference on Researches in Nanotechnology & Nanoscience

المؤتمر الدولي الثالث لتكنولوجيا و علوم النانو

University of Tehran, Iran - 2023

سومین همایش بین المللی تحقیقات جدید در علوم و فناوری نانو

3rd Intl. Conference on Researches in Nanotechnology & Nanoscience

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26th April 2023

2023 - University of Tehran، Iran

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بسم الله الرحمن الرحیم

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Address:

Enqelab Street Quds Street، Before Keshavarz Boulevard، next to

Shahed Alley، No. 37، Third Floor

Email: info@Utnano.ir

Cell: 0098 935 438 9168

Website: www.Utnano.ir

Head of Aras Intl. Campus Message

Prof. Dr. Zahra Emam-Djomeh

It is my pleasure to welcome all the participants to **The 3rd International Conference on Nanotechnology and Nanosciences**, 2023. I welcome all the eminent participants from different countries who share their knowledge and vast experience with their peers. I will give you some information about the University of Tehran and nanotechnology in Iran.

History of University of Tehran

Rooted in Jondi Shapur University, which goes back over 2,000 years, the University of Tehran, in its traditional form, was established seven centuries ago. It was founded firstly in religious seminaries ("Houza" or traditional religious schools). Other than religious studies, education covered mathematics, astronomy, medicine, literature, biology, physics, and chemistry. During the modern era, the University of Tehran evolved from a religious structure to a more modern and academic higher education structure. Dar-ol-Fonoon College was the first engineering school in its modern form, which was established almost a century ago. This was 20 years before the establishment of similar colleges in Tokyo (Japan). The University of Tehran was inaugurated in the winter of 1934.

The academic staff of the University consists of 1,650 full-time faculty members and several hundred part-time and adjunct professors and affiliated members. The University of Tehran has a broad range of international adjunct faculty members. The University also employs 3,000 personnel who work at different offices, institutes, and centers.

The University has 19,000 undergraduate and 13,000 graduate students. The University has six colleges with 39 faculties and 120 departments at its 7 campuses located in Tehran, Qom, Karaj, and its Aras International Campus (in Jolfa in Tabriz province) and Kish International Campus (in Kish Island). The University of Tehran, as the leading research university in the Country, offers more than 300 postgraduate programs.

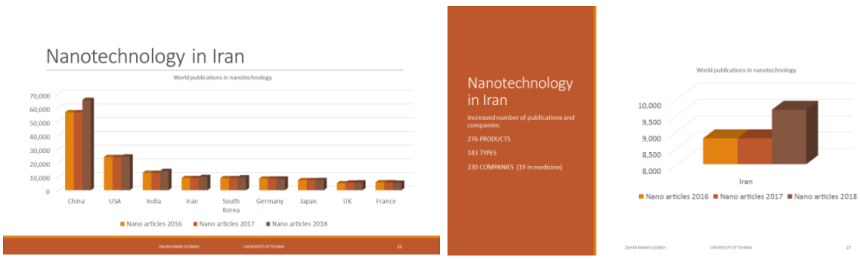
Fifteen percent of the Country's Centers of Excellence, as recognized by the government, are located at the University of Tehran, which, along with more than 40 research centers, ensure UT's commitment to research. Together, over 3,500 laboratories are active in these centers and the faculties. Besides, the University of Tehran publishes more than 50 scientific journals, some of which have the ISI index.

Nanotechnology in Iran

According to the Web of Science, Iran ranks fourth in nanotechnology globally by publishing 8,791 articles in the field. As per the latest updates, Iran holds fourth place above countries such as South Korea, Germany, Japan, and France. With the staggering number of 56,648 articles, China tops the list while the United States and India came in second and third places.

Iran's first researches in this field started in 2000, and by publishing nine articles, the Country achieved the rank of 52 in that year.

The national nanotechnology development headquarters was established in 2005 to make policies, assess nanotechnology achievements, raise public awareness about nanoscience, improve quality of life, and create lucrative markets.



Recognizing the great importance of nanotechnology, Iranians have had boosted researches in the field year on year. There are 257 companies active in this field, 33 percent working on nanomaterials, and ISNA reported on Tuesday. These companies have manufactured 376 different products using the nontechnology, showing that this is a field with huge economic and practical advantages. The reports also demonstrate that these products are being exported to 47 different countries.

Conference Head

Prof. Dr. Seyed Mohammad Alavi

Ladies and Gentlemen,

It is my great pleasure to welcome you to the “3rd Intl. Conference on Researches in Nanotechnology & Nanoscience” which is held in the Aras International Campus of University of Tehran. I take this opportunity to thank all universities and academic organizations for their help and support. For sure, without such a multilateral co-operation, we have not been able to organize this conference. The emergence of the corona virus pandemic forced us to replace our usual face-to-face meeting format with virtual platforms. The new medium of conducting our meetings has provided a chance to all of us to share our academic research, experiences, wisdom, and thoughts to make our colleagues and students familiar with new advances in our field of study globally.

We are really proud of knowing that the theme of this year's conference, i.e., “Researches in Nanotechnology & Nanoscience” has inspired a good number of researchers from various academic backgrounds. In this conference, 510 research topics have been selected for presentation. Such a contribution of researchers in various field to this conference is really encouraging. This motivates the authorities of Aras International Campus of University of Tehran to provide a unique and effective platform for researchers to publish, to present, to network, and to advance their careers. We are looking forward to our next international conference in a near future when we return to face-to-face meeting in the beautiful cities of Tehran and Jolfa.

Introduction Aras International Campus (AIC)

In order to implement the provisions of the Memorandum of Understanding signed between the University of Tehran and the Free Trade and Industrial zone Organization of Aras in 2007, the necessary steps were taken to establish the Aras International campus in the Aras Free Zone, in 2009 and after completing the necessary preparations and equipping the educational and administrative space, as well as obtaining a license from the Office for the Development of Higher Education in the Ministry of Science, Research and Technology, for the second half of the academic year 2010-2011, the students were admitted. Aras International Campus began its preparations for student admission in September 2010. After establishing the departments and attracting needed colleagues, and preparing facilities and research and educational spaces, AIC began to accept students in the second half of the academic year 2010-2011 in 9 master's degrees. And so far, more than 1,000 students have enrolled in 37 master's degrees and about 180 students in 27 areas of interest and doctoral degrees. Up to now, more than 1,000 of them have defended and graduated from their master's and doctoral theses.

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Abstracts

The effect of synthesis temperature in hydrothermal method on the properties of $CoFe_2O_4$ nanoparticles

Seyed Faridedin Rafie[1], Hani Sayahi[2], Hadi Abdollahi[3], Fatemeh Mahmoudi[4]

Abstract

In this study, $CoFe_2O_4$ nanoparticles were synthesized by hydrothermal method. In their synthesis, all physical parameters were considered constant and the same, but the oven temperature was set once at 180 and again at 240 ° C. In order to evaluate the effect of synthesis temperature on crystallization conditions, nanoparticle dimensions and magnetic properties, X-ray diffraction (XRD), dynamic light scattering (DLS) and vibrating sample magnetometer (VSM) were used, respectively. The results showed that with increasing temperature, the crystallization conditions improved and the particle size of the final product increased. Also, the dimensional distribution of nanoparticles in synthesis with higher temperature shows a narrower distribution. Regarding the magnetic properties, with increasing temperature from 180 to 240 ° C, the amount of magnetic saturation increased from 58.37 to 70.04 emu / g and the amount of magnetic residue increased from 12.15 to 14.58 emu / g. These results indicate that although increasing the temperature increases the magnetic saturation of nanoparticles, but has a negative effect on their superparamagnetic properties. Also, the synthesis of nanoparticles had a higher efficiency at higher temperatures, so that with equal number of raw materials, increasing the temperature increased the synthesis efficiency by 15%.

Keywords: Magnetic nanoparticles, spinel, $CoFe_2O_4$, hydrothermal, Synthesis, Temperature

1. School of Mining Engineering College of Engineering, University of Tehran, Tehran 1439957131, Iran
2. Chemistry and Chemical Engineering Research Center of Iran, Tehran 1496813151, Iran
3. School of Mining Engineering College of Engineering, University of Tehran, Tehran 1439957131, Iran
4. Department of Polymer and Color Engineering, Amirkabir University of Technology, Tehran, Iran

Investigating the effect of silver nanoparticles and graphene oxide in the PAN scaffold on the viability of human fibroblast cells

Setayesh Davodi, Mobina Maleki

Abstract

The human body is made up of various organs and tissues that change with age. One of these developments is tissue damage and disruption in their normal function. Fibroblast tissue is no exception. One of the approaches in the treatment of tissue damage is tissue engineering. Various methods have been used in the preparation of scaffolds in previous studies, but due to the provision of a two-dimensional environment similar to natural ECM, the electrolytic method was used for the preparation of scaffolds. The purpose of this research is to improve the scaffold properties of fibroblasts by using pan scaffold and silver nanoparticles and graphene oxide.

In order to carry out this research, firstly, graphene oxide was synthesized and silver nanoparticles were prepared and electrospun in PAN scaffold. The structure of nanofibers was examined in an electron microscope, and then fibroblast cell culture was performed on the nanofiber scaffold. At the end, the MTT biocompatibility test and DAPI staining were performed and examined with a fluorescent microscope.

The results showed that the supramolecular PAN nanofibers coated with a mixture of graphene oxide and silver with a higher density were more similar to the natural ECM of the body and showed a better ability to support cell growth and proliferation.

Keywords: silver nanoparticles, graphene oxide, pan scaffold, electron microscope, MTT

Report a risk and a proposal; Persistent Organic Pollutants (POPs), Emerginc Organic Contaminants (EOCs), and Magnetic Water-Stable Metal-Organic Frameworks (MWMOFs)

Seyed Faridedin Rafie[1], Fatemeh Mahmoudi[2]

Abstract

The problem of the lack of healthy and clean water in the last century has quickly turned from a potential danger to a real and serious problem. Water pollution is increasing gradually due to several factors such as industrialization and population growth. Emerging organic contaminants (EOCs) and Persistent organic pollutants (POPs) are among the most common pollutants that are produced and used in various ways and for different reasons. These substances have characteristics that double the dangers of their existence in water sources. Conventional water treatment methods cannot completely remove these pollutants, and studies have shown that their application does not bring satisfactory results. Adsorption and photochemical degradation are two methods that are suggested to remove these substances. The use of nanomaterials can be a very good option and the existence of the magnetic part simplifies their efficiency and separation. Metal-Organic Frameworks (MOFs) can also be combined with them and due to having unique features both in the field of adsorption and as photocatalysts, they improve the performance of the removal process of POPs and EOCs. For this purpose, studies and the path from idea to implementation have also been described.

Keywords: POPs, EOCs, Wastewater, Adsorption, Photochemical Degredation, MOFs

1. School of Mining Engineering College of Engineering, University of Tehran, Tehran 1439957131, Iran,
2. Department of Polymer and Color Engineering, Amirkabir University of Technology, Tehran, Iran

Preparation of Praseodymium oxide Nanostructure by a Simple Approach

Sahar Zinatloo-Ajabshir[1*]

Abstract

In this research, praseodymium oxide nanostructure was fabricated by a novel and easy wet chemistry approach. The role of some synthesis factors was evaluated to attain optimum condition. Results of this study display that particle morphology and size of the praseodymium oxide could be appreciably influenced by these factors. The as-synthesized praseodymium oxide nanostructure were characterized via FT-IR, FESEM, and XRD. Based on the obtained results, it was observed that with the help of this novel approach may be produced homogeneous praseodymium oxide nanostructure. The photocatalyst ability of as-fabricated praseodymium oxide nanostructure was also examined through elimination of the toxic organic contaminant under UV light.

Key words: Nanostructure, Ceramics, Praseodymium oxide, FESEM, Photocatalytic ability.

1. Department of Chemical Engineering, University of Bonab, P.O. Box. 5551761167, Bonab, Iran,

Synthesis of neodymium oxide nano powders by an easy process

Sahar Zinatloo-Ajabshir[1*]

Abstract

In this study, neodymium oxide nano powders were produced utilizing a new and facile process. To determine the optimal conditions for the preparation of neodymium oxide nano powders, the role of some fabrication parameters was evaluated. Outcome of this investigation revealed that the grain size and shape of neodymium oxide nanoparticles were significantly affected by the examined factors. The as-synthesized neodymium oxide nano powders were identified by FT-IR, FESEM, EDS and XRD. From the obtained outcomes, it was found that use of this new and facile process may be fabricated bundle-like neodymium oxide nanostructure with good homogeneity. Moreover, the photocatalyst activity of as-prepared neodymium oxide nanostructures was checked by decomposition of the organic pollution under UV light.

Key words: Nanostructure, Ceramic, Neodymium oxide, FESEM, Photocatalytic efficiency.

1. Department of Chemical Engineering, University of Bonab, P.O. Box. 5551761167, Bonab, Iran,

Chemical sensing and biosensing by microfluidic based porous silicon nanosensor via reflectometric interference spectroscopy

Fatemeh Aliabadi[1], Fereshteh Rahimi[2*], Ali Abouei Mehrizi[3], Maryam Nikkhah[4]

Abstract

Reflectometric interference spectroscopy and single-layer porous silicon can be used as a powerful nanosensor to detect a variety of biological and non-biological molecules. Incorporation this nanosensor with a microfluidic system can amplify the properties of this nanosensor, including improving sensitivity and specificity and response time. In this research, single-layer porous silicon was fabricated using electrochemical corrosion method. Microfluidic chips were fabricated using soft lithography and poly(dimethylsiloxane) (PDMS) polymer. Porous silicon was placed inside a PDMS chip. The surface of the chip containing the channel and the chip containing the porous silicon were activated by plasma oxygen in order for the two chips to adhere to each other, and then they were placed at 90 ° C for final baking. Methanol, ethanol and isopropanol alcohols with different refractive indexes were injected into the microfluidic chip by syringe pump, respectively. The results showed that our nanosensor is able to detect and differentiate between these alcohols with different refractive indexes. Through functionalization of porous silicone surface by a specific aptamer of recombinant human erythropoietin alpha (rHuEPO-α), this nanobiosensor can be used for detection of rHuEPO-α.

Key words: Porous silicon, microfluidic, reflectometric interference spectroscopy, soft lithography and PDMS polymer.

1. Division of Nanobiotechnoloy, Department of Life Science Engineering, Faculty of New Sciences and Technologies, University of Tehran, Tehran, Iran
2. Division of Nanobiotechnoloy, Department of Life Science Engineering, Faculty of New Sciences and Technologies, University of Tehran, Tehran, Iran
3. Biomedical Engineering Division, Department of Life Science Engineering, Faculty of New Sciences and Technology, University of Tehran, Tehran, Iran
4. Department of Nanobiotechnology, Faculty of Biological Sciences, Tarbiat Modares University, Tehran, Iran

Synthesis and characterizations of Three new MOFs based on Nickel and Cerium metals and: Electro analytic behavior of them for water splitting

Marziyeh Mohaghegh Nia, Dr.Reza Karimi Shervedani, Dr.Shokoufeh Geranmayeh

Abstract

Metal-Organic Frameworks (MOFs) are known as a group of nanoporous compounds. The high surface area of these materials enables their use in various applications such as adsorbent of pollutants, chemical sensors, gas storage, drug carrier, catalysts, electrocatalysts and so on. According to the limitations of fossil fuels besides the increasing need for alternative and renewable energy sources, preparing an affordable and sustainable catalyst to provide hydrogen as a clean energy carrier is an important and attractive challenge to research. In this research, different MOFs were synthesized with the metal nudes of nickel and cerium, and ligands like benzoic tricarboxylic acid, terfetaleic acid to compare their potential windows in water electrolysis reactions. The purposes of this study are to compare and investigate the binary-metal MOF structures of the Ce and Ni with single-metal ones via the electrocatalytic activity of water electrolysis. the prepared nanostructures were transferred to the surface of the GC electrode and studied as electrocatalysts for OER and HER.The kinetic quantitative results obtained at the electrode surface of the modified GC electrode with the most active nanocomposite (the Ni[(BTC)(ATPA)(DMF)(DMSO)]electrocatalyst) showed the catalytic activity with a tafel slope (b = 135 mV dec^{-1}, η10 = -650 mV) for the HER reaction. this catalyst Has more activity for the OER reaction (b = 441 mV dec^{-1}, η10 = 640 mV).

Nanotechnology , Cooling techniques for PV panel

Saeed Samadzadeh Baghbani [1]*, Soheil Samadzadeh Baghbani[2]

Abstract

Nanotechnology is the ability to create new materials, tools, and systems by controlling at the molecular and atomic levels and leveraging the properties that appear on their surfaces. From this simple definition, we can see that nanotechnology is not a new field, but a new approach in all fields. Applications for nanotechnology include everything from food, medicine, medical diagnostics and biotechnology to electronics, computers, communications, transportation, energy, the environment, materials, aerospace and national security. However, due to some limitations caused by sedimentation, erosion, clogging, and high pressure descent, this technique has not been put to practical use. The essence of improving the heat transfer of a fluid containing a small number of nanoparticles is to increase the thermal conductivity and turbulence through the suspended nanoparticles. Functional materials are composed of particles with at least one dimension less than 100 nanometers (nm) and can be classified into organic and inorganic materials. The former is composed of carbon nanotubes, graphite and nanofibers.. Nanofluids are classified as artificial colloids that have the potential to replace next-generation heat transfer media , the latter consisting of aluminum, zinc, copper, iron, aluminum oxide, iron oxide and titanium oxide.

Keywords: Nanotechnology, nanostructured , materials

1. PhD student Of Mechanics , Islamic Azad University,South Tehran Branch , Tehran , Iran
2. M.Sc of Mechanics , Islamic Azad University,North Tehran Branch , Tehran , Iran

Overview of solar cooling, nanofluid, mechanical dust removal system

Saeed Samadzadeh Baghbani[1], Soheil Samadzadeh Baghbani[2]

Abstract

Nanotechnology is the use of very small pieces of material, roughly between 1 and 100 nanometers in size, on their own or manipulating them to create new materials on a large scale, where unique phenomena enable new applications. Simply put, nanotechnology is science, engineering and technology that is done at the nanoscale. Nanotechnology derives its name from the prefix "nano". Solar Cooling Technologies provides a detailed study of potential technologies for coupling solar energy and cooling systems. Solar cooling is a system that converts heat from the sun into coolant that can be used for refrigeration and air conditioning. A solar cooling system collects solar energy and uses it in a thermal cooling process, which in turn is used to reduce and control temperatures for purposes such as producing chilled water or air conditioning for a building. There are many cooling cycle techniques using different principles of operation. Three of the most popular techniques are: absorption cycles, drying cycles, solar mechanical cycles.

Key words: cooling, nano, nano fluid, solar energy

1. PhD student in mechanics, Department of Mechanical Engineering, Islamic Azad University, South Tehran Branch, Tehran, Iran
2. Master of Mechanics, Department of Mechanical Engineering, Islamic Azad University, North Tehran Branch, Tehran, Iran

Overview of solar coolers, solar batteries and car batteries

Saeed Samadzadeh Baghbani[1], Soheil Samadzadeh Baghbani[2]

Abstract

Solar cooling is a system that converts heat from the sun into coolant that can be used for refrigeration and air conditioning. A solar cooling system collects solar energy and uses it in a thermal cooling process, which in turn is used to reduce and control temperatures for purposes such as producing chilled water or air conditioning for a building. There are many cooling cycle techniques using different principles of operation. Three of the most popular techniques are absorption cycles, desiccant cycles, solar mechanical cycles. Regardless of the technique used, a solar cooling system usually consists of three main components: a solar collector, such as a solar panel, which is used to convert sunlight into heat or mechanical work; a refrigeration or air conditioning device used to Coolant production is used. A heat sink that collects the rejected heat and removes it from the system. Home energy storage batteries have been on the market for years now in many different types and sizes. Due to rapid advances in lithium technology, modern lithium battery systems are rapidly replacing traditional lead-acid batteries as manufacturers develop smart, modular systems to suit various energy storage applications.

Keywords: solar cooling, solar battery, atomic battery

1. PhD student in mechanics, Department of Mechanical Engineering, Islamic Azad University, South Tehran Branch, Tehran, Iran
2. Master of Mechanics, Department of Mechanical Engineering, Islamic Azad University, North Tehran Branch, Tehran, Iran

Hydrogels reinforced with TiO_2-NPs for wound healing application

Adnan Alizadeh Naini[1], Mohammad Jafar Hadianfard[2], Seyedeh-Sara Hashemi[3], Mehdi Kian[4], Reyahaneh Bakhshizadeh[5]

Abstract

Full-thickness wounds are a growing problem due to their high costs and complications. Despite recent advances in wound healing, several systemic and local factors can impair the physiological healing process. This article briefly examines the role of titanium dioxide nanoparticles in the healing wound process. Hydrogels are a type of scaffold with 3D networks that are widely used for tissue regeneration. Hydrogels have a porous structure containing macromolecules or polymers that can easily swell in water. Nano-based materials have unique physicochemical, optical, and biological properties compared to their bulk counterparts. Nanoparticles can be incorporated into scaffolds to create smart nanocomposite materials that improve wound healing through antimicrobial properties as well as anti-inflammatory and selective angiogenic properties. Nanoparticles have been used for drug delivery due to their high surface area. In addition, nanoparticles affect wound healing by influencing collagen deposition and reorganization, providing approaches for skin regeneration and wound healing. Titanium dioxide nanoparticles (TiO_2-NPs) is a metal oxide nanoparticle that has recently received attention in biomedical applications due to their non-toxicity, antibacterial activity, and chemical stability. Research into wound healing applications has led to reports of accelerated wound healing and ingrowth of vascular tissue.

Keywords: Wound healing, Hydrogel, Titanium dioxide nanoparticles, antibacterial.

1. Department of Materials Science and Engineering, Shiraz University, Shiraz, Iran.
2. Department of Materials Science and Engineering, Shiraz University, Shiraz, Iran.
3. Burn and Wound Healing Research Center, Shiraz University of Medical Sciences, Shiraz, Iran.
4. Department of Comparative Biomedical Sciences, School of Advanced Medical Sciences and Technologies, Shiraz University of Medical Sciences, Shiraz, Iran
5. Department of Nanobiotechnology, Faculty of Biological Sciences, Tarbiat Modares University, Tehran, Iran.

Study of the effect of polyvinylpyrrolidone concentration on the optical properties of cerium oxide

Sepideh Mehramouz, Samaneh Rasouli Jamnani; Hossain Milani Moghaddam,

Abstract

In this work, the nanostructures of CeO_2 were synthesized by hydrothermal method with cerium(III) nitrate hexahydrate and different concentrations of polyvinylpyrrolidone (PVP) as a surfactant. We studied the effect of PVP concentration on optical, structural and morphological properties with characterization such as Ultraviolet–Visible spectroscopy (UV-vis), X-Ray Diffraction (XRD) and Field Emission Scanning Electron Microscope (FESEM). The XRD results showed the cubic fluorite crystal structure for different synthesizes. The mean crystallite size was obtained by Debye- Scherrer formula. FESEM analysis showed that the CeO_2 samples have a micropolyhedron morphology composed of triangular nanoplates. Decreasing the PVP concentration in synthesize caused in changing of cross section from triangle to Three-bladed triangle. Absorption rate, transmission coefficient, refractive index and extinction coefficient were calculated. The results showed that the decreasing the PVP concentration decreased the extinction coefficient and increased the refractive index in the characteristic 550nm wavelength.

New Portable Mold for Fabrication of Various Microfluidic Systems

Elham Effati[1]

Abstract

This work describes a new appliance for design and fabrication of various 3D microchannels by a quick process known as micro-wire molding. The method provides several possibilities including simultaneous curing and molding without any displacement or a curing oven. Both metallic and Nylon micro-wires can be used in this method. The method is designed so that the molding container needs minimal polydimethylsiloxane providing possibility to produce channels with different cross-sections, shapes and geometries.

Keywords: Poly(dimethylsiloxane); Droplet; Microfluidic; Microchannel; Micromixer; Wire molding

1. Polymer Engineering Department, Faculty of Engineering, University of Bonab, Bonab-Iran,

Chitosan nanoparticles-based therapeutics for multidrug-resistant bacterial infections

Alaleh Valiallahi[1*], Maryam Davoudi[2]

Abstract

Today, the number of effective antibiotics for the treatment of infectious diseases is rapidly declining, which has a serious impact on human health. The pharmaceutical and biomedical sections are facing the ongoing increase in multidrug-resistant (MDR) human pathogens. MDR bacterial infections lead to considerable growth in morbidity, fatality and cost of long-term treatments. Nanomaterial therapy is an instrument that promises to fight sever-to-treat bacterial infections that can bypass existing mechanisms associated with acquired drug resistance. Recently, chitosan has received a lot of attention for its role in inhibiting bacteria and drug delivery. Because chitosan contains many functional bioactive groups that promote chemical reactions and transformations. Also It has numerous advantages, such as nontoxicity, biocompatibility, and biodegradability. Multifunctional Chitosan nanoparticles represent a new hope for the treatment of various pathogenic bacteria that cause antibiotic resistance. This study discusses the antibacterial activity of chitosan nanoparticles against of the MDR bacteria. Although the in vitro antimicrobial activity of chitosan and its derivatives has recently been studied, in vivo activity has been insufficiently accumulated. This study will focus more on recent studies of in vivo antimicrobial activity of chitosan as a carrier of antibacterial agents to treat MDR.

Keywords: multidrug-resistant (MDR), Nanomaterial, antibacterial agent, chitosan nanoparticles

1. Department of Microbiology, Faculty of Biological Sciences, Alzahra University,Tehran, Iran.
2. Department of Clinical Laboratory Sciences, Faculty of Allied Medicine, Tehran University of Medical Sciences, Tehran, Iran.

Production and evaluation of nanoemulsion containing gallic acid

Raheleh Amirigavigani[1]*, Sanaz Sheikhzadeh[2], Seyyed Meysam Abtahi froushani[3]

Abstract

Breast cancer is the common type of cancer in women worldwide. It is recorded that about 12 percent of women in the United States have experienced breast cancer in their lifetimes. Gallic acid is a polyphenolic acid compound with cytotoxicity properties against cancer cells. The chemo-preventative activity of gallic acid is due to its anti-oxidant and apoptosis inducing effects. As the nanomedicine is a versatile delivering module for specific drug delivery to their targets, the production of nanoemulsions containing gallic acid and its anti-cancer effects on mouse breast cancer cell line was examined in this study. Nanoemulsion containing gallic acid was produced using Tween 80 as a surfactant and lecithin as an oil phase by single-phase oil-in-water emulsion method. Using inverted fluorescence microscope, the appearance characteristics of produced nanoemulsions were investigated and also the encapsulation efficiency of nanoemulsion containing gallic acid was calculated. Breast cancer cell line (4T1) was cultured under standard cell culture conditions and then different concentrations of nanoemulsion containing gallic acid (40, 30, 20, 10, 5, 2.5, 0 ug/ml) were applied on the breast cancer cell line. The effect was given and the survival rate of cancer cells was investigatedThe microscopic results showed that the produced nanoparticles are spherical with a smooth surface and uniform size distribution, and the encapsulation efficiency of the nanoparticles was 80.35 ± 0.4%. Nanoemulsion containing gallic acid decreased the survival of 4T1 cancer cells. Finally, it is suggested that the produced nanoemulsion can be used as a new therapeutic method in the targeted treatment of cancer cells with less toxicity and higher efficiency.

Keywords: drug delivery, viability, cancer, gallic acid

1. Department of Microbiology, Faculty of Veterinary Medicine, Urmia University, Urmia, Iran
2. Department of Microbiology, Faculty of Veterinary Medicine, Urmia University, Urmia, Iran
3. Department of Microbiology, Faculty of Veterinary Medicine, Urmia University, Urmia, Iran

Production of nanoemulsion containing hesperidin and evaluation of its anticancer effects

Mohammad Amin Bakhshan[1]*, Sanaz Sheikhzadeh[2], Nowruz Delirezh[3]

Abstract

Prostate cancer is one of the most common cancers in men. There are different treatment methods for prostate cancer. Nanoparticles not only protect drug compounds but also improve intracellular drug delivery. As a strong flavonoid, hesperidin has good anti-cancer properties. The production of hesperidin nanoparticles can be an effective method in cancer treatment. To prepare nanoparticles containing hesperidin, lecithin was used as an oily phase, and Tween 80 as a surfactant. The morphology of produced nanoparticles as well as the encapsulation efficiency of nanoparticles containing hesperidin were evaluated. In order to investigate the anticancer effects of produced nanoparticles, different concentrations of hesperidin nanoparticles (40, 30, 20, 10, 5, 2.5, 0 ug/ml) were affected on the prostate cancer cell line and the viability of the cancer cells was determined. Spherical nanoparticles with uniform dispersion and encapsulation efficiency of 84.04 ± 1.3% were obtained. The results showed that hesperidin nanoparticles decrease the viability of LNcap cancer cells in a dose-dependent manner. The results of this study indicate the anticancer effect of hesperidin nanoparticles on prostate cancer and can be a suitable candidate for additional studies and introduction as a complementary treatment for prostate cancer.

Keywords: Prostate cancer, Hesperidin, Nanoemulsion, Encapsulation Efficiency

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1. Department of Microbiology, Faculty of Veterinary Medicine, Urmia University, Urmia, Iran.
2. Department of Microbiology, Faculty of Veterinary Medicine, Urmia University, Urmia, Iran.
3. Department of Microbiology, Faculty of Veterinary Medicine, Urmia University, Urmia, Iran.

Synthesis and charactrisation of pure La_2ZnTiO_6 Perovskite nanoparticles and doped with silver by sol-gel method and investigation of its optical Properties improvement.

Hadiseh Akbari*, Masoud hamadanian

Abstract

In this project, the nanostructure of pure la_2ZnTiO_6 perovskite oxide and doped with different amounts of silver was successfully synthesized by sol-gel method. The prepared nanostructures were investigated using different techniques such as XRD, FT-IR, SEM, EDS, PL.

the results of Photocatalytic test showed that pure La_2ZnTiO_6 perovskite shows suitable photocatalytic activity for decolorization of Rhodamine B dye under UV light and has the ability to decolorize 84.53% and 30.60% of Rhodamine B dye under UV and visible light, respectively.

In exchange for adding different amounts of silver in la_2ZnTiO_6 perovskite structure, following increasing photoluminescence intensity and increasing the recombination of charge carriers, the photocatalytic activity of perovskite compound decreased to 43.4 and 22.57 under ultraviolet and visible light, respectively, which was in accordance with photoluminescence results.

Keyword: Perovskite- Sol-gel- photololuminescence-silver-photocatalytic

Synthesis and charactrisation of La_2ZnTiO_6 Perovskite nanoparticles doped with silver by solgel method and investigation of its application in the field of hydrogen storage.

Hadiseh akbari[1]*, Masood hamadanian[2]

Abstract

In this project, the nanostructure of la_2ZnTiO_6 perovskite oxide with different amounts of silver was successfully synthesized by solgel method. The prepared nanostructures were investigated using different techniques such as XRD, FT-IR, SEM, EDS, PL. Hydrogen storage properties of nanostructures were investigated using electrochemical methods such as chronopotentiometery and cyclic voltammetry, using Sama500 device in a 3-electrode system and in 2M solution potassium hydroxide as an electrolyte.

Hydrogen storage capacity for pure La_2ZnTiO_6 perovskite nanostructure was 237.74 mAh/g. By adding different amounts of silver in the structure of La_2ZnTiO_6 perovskite, hydrogen storage properties were improved and hydrogen storage capacity reached to 500 mAh/g.

Keywords: perovskite ; Hydrogen storage ; solgel ; cyclic voltametrey ; silver.

1. No 89-Unit 2-Yas 4 alley-Kowsar town-Babaie highway-Tehran
2. Kashan university-Qotb ravandi boulevard-2 phase naji abad town-Kashan

Smart Laptop Cooling Pad Using AVRMicrocontrollers

Raana Baniamerian[1], Zhila Amini-Sheshdeh[2]

Abstract

— Nowadays, most tasks are entangled with devices like laptops. To keep them in healthy condition, accessories such as cooling pads are essential and assist the device to reduce its temperature. Since they are manual, despite not being needed, they keep running. Microcontrollers can assist us to avoid this and to expand the lifespan of devices. In this paper, an add-on device has been proposed that can be attached to all common cooling pads in order to make them smart: more energy-efficient and limited operation time based on necessity. The innovation regarding this device is that no external thermal sensor has been used.

Keywords: AVR Microcontrollers; Laptop Cooling Pad; Smart Cooling Pad

1. Department of Electrical Engineering Faculty of Engineering, Alzahra University Tehran, Iran
2. Department of Electrical Engineering Faculty of Engineering, Alzahra UniversityTehran, Iran

Biosynthesis of selenium nanoparticles by *Limosilactobacillus fermentum*

Seyed Amirhamze Aminisough[1], Sara Daneshjou[2*], Khosro Khajeh[3], Abbas Akhavan Sepahy[4]

Abstract

The biosynthesis of metal nanoparticles is a new approach to the synthesis of nanoparticles that has received much attention in recent years. Reducing the toxicity of synthesized nanoparticles compared to the ion of nanoparticles, no damage to the environment during the synthesis process, and no use of chemicals to create stability in nanoparticles are the main advantages of the nanoparticle synthesis method. Plant extracts or bacterial cell extracts can be used for biosynthesis. Selenium nanoparticle (SeNP) is a bioactive compound with significant in vivo applications and is well known. In this research, we synthesized SeNP with the help of sodium selenite (Na2SeO3.5H2O) and the cell extract of the non-pathogenic bacteria *Limosilactobacillus fermentum*. Next, the characteristics of biosynthesized nanoparticles were investigated by UV-Vis spectroscopy, FE-SEM, and DLS characterization methods. According to the obtained results, the nanoparticles are well synthesized during the process, UV-Vis peak is in the range of 350 nm, and are spherical in shape..

Keywords: biosynthesis, *Limosilactobacillus fermentum*, characterization, selenium nanoparticle

1. Department of Nanobiotechnology, Faculty of Biological Science, Tarbiat Modares University, Tehran, Iran
2. Department of Nanobiotechnology, Faculty of Biological Science, Tarbiat Modares University, Tehran, Iran
3. Department of Biochemistry, Faculty of Biological Science, Tarbiat Modares University, Tehran, Iran
4. Department of Microbiology, Faculty of Basic Science, Islamic Azad University, Tehran, Iran

3rdInternational Conference on Reesearches in Nanotechnology & Nanoscience Molecular immunogenicity and coronavirus diagnosis

Fatemeh keivan[1]

Abstract

Covid-19 virus was an unknown virus that has been affecting the world since late 2019. Due to its high transmissibility, the virus has infected many people and affected the entire world order. To this end, humans sought ways to diagnose and treat it. In the same way, we decided to study the pathogenicity of molecular immunity and the diagnosis of coronary heart disease in this article.In the end, after the studies done in this article, we concluded thatViral factors include virus type, mutation, viral load, viral titer, and viability of the virus in vitro. The individual's immune system factors include genetics (such as HLA genes), age, gender, nutritional status, neuroendocrine-immune regulation, and physical status. These factors all contribute to whether an individual is infected with the virus, the duration and severity of the disease, and the reinfection. In the early stages of the epidemic, accurate diagnosis helps control the spread of the disease.

Keywords: Immunology, disease, corona, molecules.

1. urmia university

Experimental study of impact resistance in TPU and Multi-walled carbon nanotube reinforced PA6 -Based Nanocomposites

Mohammad Reza Mousavi [1], Karim Shelesh-Nezhad[2]

Abstract

Polymer nanocomposites based on PA6/TPU reinforced with carbon nanotubes were prepared via melt-mixing technique using a co-rotating twin-screw extruder. The morphology and mechanical properties of different samples were studied. SEM analysis indicated good compatibility between blended phases in the presence and absence of CNTs. Moreover, SEM showed uniform dispersion of CNTs in polymer matrix and good adhesion of polymer to CNTs. According to the mechanical impact resistance test results, the addition of TPU into PA6 significantly increased notch-impact strength. Inclusion of CNTs into PA6/TPU improved notch-impact resistance. The appropriate dispersion of CNT and interaction of constituent phases were crucial factors yielding improved properties in PA6/TPU/CNT nanocomposites.

Keywords**:** PA6, TPU, CNT, Morphology, Mechanical property

1. Plastics and Composites Engineering Center, Department of Mechanical Engineering, University of Tabriz, Tabriz,

2. Plastics and Composites Engineering Center, Department of Mechanical Engineering, University of Tabriz, Tabriz,

Removal of textile pollutant (Reactive Orange 14) used by nanoporous material (MIL-101)

Faeze Nasrollahi, BayramAli Mohammadnezhad*, Niyaz Mohammad Mahmoodi, AbdolReza Karimi

Abstract

Finite water sources motivated researchers to develop different methods for sewage treatment. Adsorption has been known as a brilliant technique for decontamination due to low cost, simplicity of design, wide range of application and facile regeneration of the adsorbents. Coordination polymers has appeared as promising materials for diverse applications. dyestuff is a widespread contaminant released in effluents of textile, leather and paper industries. Harmful effects of organic dyes discharged in effluents are toxicity, high color, reducing light penetration in water, high stability, and low degradation capability. For high-performing adsorption, materials with high surface area, porosity and specific adsorption sites are expected. Metal-organic frameworks are significantly noticed in last decades. they represent functional hybrid materials that are comprised of inorganic metal ions or metal clusters linked by organic ligands through coordination bonds. Among all MOFs, MIL-101 MOFs show higher chemical and hydrothermal stabilities. Functionalized MIL-101(Fe) is prepared via post synthesis method and used in order to investigate the adsorption of reactive orange 14 from aqueous solutions. Characterization and study of synthesized nanocomposite were investigated by FTIR analyze. According to the studies, the max removal efficiency and adsorption capacity were enhanced by functionalized sample.

Keywords: Dye removal, Functionalized, Metal-organic framework

Exosomes as carriers in drug delivery and cancer therapy

Elina Barazesh[1], Mostafa Govahi[2]

Abstract

Nanotechnology keeps bioactive materials from degenerating by presenting nanocarriers, thus allowing the application of types of natural bioactives as therapeutic agents. Exosomes are human body's natural vesicles which became quiet notable and subjects of many studies due to their specific features and high compatibility. These vesicles contribute in body functions such as transferring genetic materials and messengers in between cells. Furthermore, exosomes possess high targeting ability, low toxicity and high maintenance in blood circulation. Since they're derived from natural body cells, they can pass through blood brain barrier. According to studies, exosome is able to transfer small molecules, like Curcumin, to the target tissue more efficiently. In addition, they can carry big molecules including DNAs and different types of RNAs. These vesicles are natural carriers of miRNA. Exosomal miRNA could be exercised as biomarker in various disease. Exosomes could also be a potential drug delivery system for new generation of therapeutics, meaning siRNAs. As a consequence, they permit medical science to benefit the high therapeutically properties of these molecules. All these characteristics enhances the efficiency of Exosome-drug complex in comparison with free drugs, indicating that exosomes are promising drug delivery systems which could be utilized in treatment of countless disease, especially cancer.

Keywords: Exosome, Drug delivery, Cancer therapy, Nanobiotechnology, Nanocarrier

1. Graduate student of Microbial Biotechnology, Faculty of Biotechnology, Amol University of Technology, Amol, Iran.
2. Department of Nano Biotechnology, Faculty of Biotechnology, Amol University of Special Modern Technologies, Amol, Iran

Effect of Mid-Gap States on Performance of Tunneling Field-Effect Transistor Based on Antimonene

Hossein N.Niknezhad[1] , Shoeib Babaee Touski[2]

Abstract

In this paper, effects of mid-gap states on electrical behavior of Tunneling Field-Effect Transistor is investigated using non-equilibrium Green's function through a tight-binding approach. Antimonene monolayer is utilized as a sample for channel. In the following, atom vacancy is created to generate mid-gap states. The creation of the mid-gap state due to the vacancy is shown using the local density of states for the TFET and the density of states for a ribbon. Furthermore, the effects of these mid-gap states on the ON-current and OFF-current are discussed.

Keywords- Antimonene, NEGF, Tight-binding, Tunneling Field-Effect Transistor (TFET), Two-dimensional material, Vacancy defect.

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1. Master of Electrical Engineering (Electronic Integrated Circuits) Hamedan University of Technology, Hamedan, Iran
2. Assistant Professor of Electrical Engineering, Department of Electrical Engineering, Hamedan University of Technology, Hamedan, Iran

Investigation the electronic and spin properties of two-dimensional materials of $SMAN_2$(M=Mo, W;A=Si, Ge)

Ehsan Zamanian[1], Shoeib Babaee Touski[2]

Absract

In this research, the electronic and spin properties of two-dimensional materials with the formula $SMAN_2$ (M = Mo, W; A = Si, Ge) are investigated by density functional theory. This new structure is a combination of transition metal dichalcogenide (MoS_2) and $MoSi_2N_4$ material. We proposed and investigated the asymmetric structures $SMAN_2$ (M=Mo,W;A=Si, Ge)constructed and optimized from $MoSi_2N_4$ by replacing SiN_2 on one side with chalcogen S atom. The structural and electronic properties of single layers of this group of materials are theoretically investigated using computational methods. The structural and electronic properties of single layers of this group of materials are theoretically investigated using computational methods. All these monolayers have semi-conducting behavior with a significant band gaps. For two materials, $SMoSiN_2$ and $SWSiN_2$, the maximum valence band (VBM) occurs at K- point, while for the other two materials, the maximum valence band (VBM) occurs at a point close to Γ. By applying spin to $SWGeN_2$ and $SWSiN_2$ materials, the up and down spins are separated in two conduction and valence bands. The maximum spin-spliting is for $SWSiN_2$ material.

Keywords: Electron density-band gap-graphene-two-dimensional materials-density functional Theory

1. Master of Electrical Engineering (Micro and nano electronic devices) Hamedan University of Technology, Hamedan, Iran

2. Assistant Professor of Electrical Engineering, Department of Electrical Engineering, Hamedan University of Technology, Hamedan, Iran

Investigation of antibacterial properties of plant extracts *Scrophularia striata* and *Lowsonia inermis* On *Staphylococcus aureus* and *Escherichia coli* bacteria

Ali Akbarpour[1], Mostafa Rahimnejad[2], Mona Sadeghi[3] , Farideh Feizi[4]

Abstract

The belief that some plants have healing properties goes back many years. Among these natural products are substances that we normally know and use as antimicrobial agents. On the other hand, the use of antibiotics by bacteria is increasing day by day, which makes it necessary to think about replacing antimicrobial agents with less side effects instead of antimicrobial agents with less effect and more unwanted side effects. In this study, the antibacterial properties of the extracts of Thirsty plant and henna leaf were investigated on Staphylococcus aureus and Escherichia coli microorganisms. Then, the antibacterial activities of extracts with 100, 200 and 500 mg/ml were evaluated by disc diffusion method in agar and drug counting on standard strains. The results showed that the most important antimicrobial fight of henna leaves against staphylococci and thirsty perfume was related to Escherichia coli. Most of the percentage of lethality has been shown by henna leaves against Staphylococcus aureus and thirst extract against Escherichia coli bacteria. The diameter of the halo of non-growth of thirsty and henna leaves against Staphylococcus aureus is 20 mm and 22 mm, respectively, and against Escherichia coli, it is 26 mm and 20 mm, respectively. Investigation of the antibacterial effect showed that the plant extracts are effective on the plants and Staphylococcus aureus. Therefore, these plant extracts can be a suitable option for future studies in vitro to prepare antibody drugs.

Keywords: Antibacterial properties, Agar disk diffusion method, *Lowsonia inermis* plant extract, Bacterial counting method, *Scrophularia striata* plant extract,

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1. Babol noshirvani university of technology, Mazandaran, Iran.
2. Babol noshirvani university of technology, Mazandaran, Iran.
3. Babol noshirvani university of technology, Mazandaran, Iran.
4. Babol University of Medical Sciences, Mazandaran, Iran.

Investigation of antibacterial properties of plant extracts *Malva sylvestris* On *Staphylococcus aureus* and *Escherichia coli* bacteria

Ali Akbarpour[1], Mostafa Rahimnejad[2], Mona Sadeghi[3] , Farideh Feizi[4]

Abstract

Nowadays, with the increase of resistances caused by the excessive use of chemical synthetic antibiotics, it seems necessary to find alternative drugs that have both antibacterial properties and the least side effects for humans. Medicinal plants with antimicrobial properties have been considered in many studies. Malva sylvestis has an important place in traditional medicine and herbal medicine industry. In this study, the antibacterial property of Malva sylvestris plant extract was investigated on Staphylococcus aureus and Escherichia coli microorganisms. Then, the antibacterial activity of the extract with concentrations of 100, 200, and 500 mg/ml was investigated by disc diffusion method in agar and bacterial counting on the standard strain of the mentioned bacteria. The results showed that the extract of desert cheese plant inhibited the growth of Staphylococcus aureus and Escherichia coli bacteria. completely prevented, so that its antibacterial effect increased with increasing the concentration of the extract. The highest antimicrobial sensitivity of desert cheese extract against Staphylococcus aureus bacteria was 95.80% and against Escherichia coli bacteria was 89.15%. Investigation of the antibacterial effect showed that the plant extract of desert cheese has a lethal effect on Escherichia coli and Staphylococcus aureus bacteria. Therefore, this plant extract can be a suitable option for future studies in vitro to prepare antibacterial drugs.

Keywords: Antibacterial properties, Agar disk diffusion method, , Bacterial counting method, *Malva sylvestris* plant extract,

1. Babol noshirvani university of technology, Mazandaran, Iran.
2. Babol noshirvani university of technology, Mazandaran, Iran.
3. Babol noshirvani university of technology, Mazandaran, Iran.
4. Babol University of Medical Sciences, Mazandaran, Iran.

Smart Mug for the Blind

Negin Sadat Khoddaman, Zhila Amini Sheshdeh

Abstract

- Pouring a hot drink into a glass is one of the challenges of the blind in their daily lives. Because they can know the height of the liquid in the glass only by using their finger to prevent it from overflowing. Another problem is that after the liquid reaches the desired height, they can only know the temperature of the drink if they check the temperature with their fingers until it cools down. In addition to burning their fingers, this will also result in wasting time for constantly checking the temperature of the liquid. Therefore, in order to solve these problems, we designed a circuit that by applying it to each glass, in addition to the height of the drink, it also informs the blind that it has reached the desirable temperature for drinking by playing the necessary audio alerts.

Keywords - height, temperature, blind people

ZnO nanoparticles with remarkably enhanced sunlight-driven photocatalytic performance

Roya Mohammadipour Nodoushan[1], Shahla Shekarriz[2], Zahra Shariatinia[3], Majid Montazer, Abolfazl Heydari[4]

Abstract

Global environmental pollution and energy supply demand have been regarded as important concerns in recent years. Zinc oxide (ZnO) based nanostructures have gained remarkable attention worldwide for their photocatalytic activation behavior as a semi-conductor metal oxide photocatalyst in different industries. Herein, a high-performance photocatalyst of ZnO nanoparticles was synthesized via a sol gel route and used for the photodegradation of methylene blue from water under sunlight. The nanoparticle was characterized by X-ray diffraction, scanning electron microscopy, energy dispersive x-ray spectroscopy (EDX), and UV–Vis diffusion reflectance spectroscopy. For the photodegradation of methylene blue as an organic dye under sun light, ZnO NPs exhibited remarkably enhanced photocatalytic efficiency.

Key word: ZnO NPs, photocatalytic activity, semiconductor, sun light

1. Color and Polymer Research Centre, Amirkabir University of Technology (Tehran Polytechnic), 15875-4413, Tehran, Iran
2. Department of Chemistry, Amirkabir University of Technology (Tehran Polytechnic), 15875-4413, Tehran, Iran
3. Department of Textile Engineering, Amirkabir University of Technology (Tehran Polytechnic), 15875-4413, Tehran, Iran
4. Polymer Institute of the Slovak Academy of Sciences, Dúbravská cesta 9, 845 41 Bratislava, Slovakia

Functionalization of cotton fabric with ZnO NPs: synthesis, characterization and UV protection

Roya Mohammadipour Nodoushan[1], Shahla Shekarriz[2], Zahra Shariatinia[3], Majid Montazer, Abolfazl Heydari[4]

Abstract

The synthesis and characterization of nanosized zinc oxide particles and their effect on cotton fabric have been studied for the protection against UV irradiation. The nanoparticles were synthesized via a wet chemical route and applied on the cotton fabric with pad dry cure method. Zinc nitrate hexahydrate was used as precursor. The treated cotton fabric is characterized via X-ray powder diffraction (XRD) and Fourier-transform infrared spectroscopy (FTIR). Moreover, the UV-protection of sample is investigated by Color Eye 7000A Spectrophotometer. It is found that the treated cotton fabric with ZnO NPs had the highest UVP percentage around 77.8 %.

Key words: cotton fabric, ZnO nanoparticles, UV protection

1. Color and Polymer Research Centre, Amirkabir University of Technology (Tehran Polytechnic), 15875-4413, Tehran, Iran
2. Department of Chemistry, Amirkabir University of Technology (Tehran Polytechnic), 15875-4413, Tehran, Iran
3. Department of Textile Engineering, Amirkabir University of Technology (Tehran Polytechnic), 15875-4413, Tehran, Iran
4. Polymer Institute of the Slovak Academy of Sciences, Dúbravská cesta 9, 845 41 Bratislava, Slovakia

Design and build a toy based on microelectronics with the approach of teaching emotions to children

Abstract

– We have been taught in linguistics courses in secondary school that when there is a word for something, that thing is counted as an individual being. According to that, we can use this substance for psychological regards. We aim to build a device that teaches children aged three to seven how to know their feelings and what is the best approach towards each of the different emotions they experience by taking advantage of the bright side of technology. There are six buttons mounted on the surface of this device, and children are to push them whenever they feel something. Followingly, they will be introduced to their sentiments and then listened to pre-recorded voices containing effective and sensational methods corresponding to pushed-button.

Keywords: toy, audio player, microcontroller, play a voice

Biotin-Targeted Nanomicellar Formulation of an Anderson-Type Polyoxomolybdate: Synthesis and In Vitro Cytotoxicity Evaluations

Maryam Ramezani-Aliakbari[1*], Jaleh Varshosaz[2], Hojjat Sadeghi-aliabadi[3], Farshid Hassanzadeh[1], and Mahboubeh Rostami[4]

Abstract

This study is aimed at developing a micellar carrier for an Anderson-typemanganese polyoxomolybdate (TRIS-MnPOMo) to improve the potency and reducethe general toxicity. The biotin-targeted stearic acid−polyethylene glycol (SPB)polymeric conjugate was selected for the first time as a micelle-forming basis for thedelivery of TRIS-MnPOMo to breast cancer cells. The cytotoxicity of TRIS-MnPOMoand its nanomicellar form (TRIS-MnPOMo@SPB) was evaluated against MCF-7,MDA-MB-231 (breast cancer cell lines), and HUVEC (normal cell line) in vitro usingthe MTT assay. The quantity of cellular uptake and apoptosis level were studiedproperly using standard methods. The hydrodynamic size, zeta potential, andpolydispersity index of the prepared micelles were 140 nm, −15.6 mV, and 0.16,respectively. The critical micelle concentration was about 30 μg/mL, which supports thecolloidal stability of the micellar dispersion. The entrapment efficiency was interestinglyhigh (about 82%), and a pH-responsive release of TRIS-MnPOMo was successfullyachieved. The micellar form showed better cytotoxicity than the free TRIS-MnPOMo on cancer cells without any significant hemeand normal cell toxicity. Biotin-targeted nanomicelles internalized into the MDA-MB-231 cells interestingly better than nontargetedmicelles and TRIS-MnPOMo, most probably via the endocytosis pathway. Furthermore, at the same concentration, micellesremarkably increased the level of induced apoptosis in MDA-MB-231 cells. In conclusion, TRIS-MnPOMo@SPB could profoundlyimprove potency, safety, and cellular uptake; these results are promising for further evaluations in vivo.

Key words: Micelle, Drug delivery, Polyoxomolybdate, Breast cancer

1. Department of Medicinal Chemistry, School of Pharmacy and Pharmaceutical Sciences, Isfahan University of Medical Sciences, Isfahan, Iran.
2. Novel Drug Delivery Systems Research Center and Department of Pharmaceutics, School of Pharmacy, Isfahan University of Medical Sciences, Isfahan, Iran.
3. Department of Medicinal Chemistry, School of Pharmacy and Pharmaceutical Sciences, Isfahan University of Medical Sciences, Isfahan, Iran.
4. Department of Medicinal Chemistry, School of Pharmacy and Pharmaceutical Sciences, Isfahan University of Medical Sciences, Isfahan, Iran.

Photoconductivity investigation of plasmonic gold nano-island film

Sara Sadeghi, Mohammad Mohammadimasoudi*, Hossein Mehrzad, Ezeddin Mohajerani

Abstract
A gold nano-islands thin films were fabricated by sputtering deposition of gold on an ITO interdigitated electrode and annealing. The plasmonic enhanced conductivity behavior of the gold nano-island film is investigated. Current and voltage of the film are measured whereas the low power laser at a wavelength corresponding to the plasmonic absorption spectrum (λ= 532 nm) are radiated to the film. The photoconductivity of the nanostructured film as a function of the laser irradiance is measured. The current of the film increases as the laser power increases. The increased current is due to highly localized plasmonic electric field around the nanoparticles which is the dominant mechanism in the photoconductance of gold nano-islands films. Tunneling effect between similar electrodes separated by an insulating thin barrier allows current to flow in discontinuous films.

Photoconductivity investigation of plasmonic gold nano-island film

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Abstract

A gold nano-islands thin films were fabricated by sputtering deposition of gold on an ITO interdigitated electrode and annealing. The plasmonic enhanced conductivity behavior of the gold nano-island film is investigated. Current and voltage of the film are measured whereas the low power laser at a wavelength corresponding to the plasmonic absorption spectrum (λ= 532 nm) are radiated to the film. The photoconductivity of the nanostructured film as a function of the laser irradiance is measured. The current of the film increases as the laser power increases. The increased current is due to highly localized plasmonic electric field around the nanoparticles which is the dominant mechanism in the photoconductance of gold nano-islands films. Tunneling effect between similar electrodes separated by an insulating thin barrier allows current to flow in discontinuous films.

Investigating the effects of pulsed plasma optimization on suspended nanoparticles

Rahemeh Kashefi Habashi[1], Mohammad Taghi Ahmadi[2], Meisam Rahmani[3*]

Abstract

Today, one of the challenging areas in the field of nanotechnology is air pollution caused by suspended nanoparticles. The use of new technologies effective in reducing the pollution caused by these particles, which include advantages such as simplicity, convenience and high efficiency, has always attracted the attention of researchers and researchers. It has been discussed on suspended nanoparticles. Based on this, the efficiency of non-thermal pulsed plasma in the electrical discharge reactor system with dielectric barrier (DBD) has been evaluated and measured, as well as the effect of parameters such as applied voltage and pulse repetition frequency in the cylindrical reactor of cold plasma in order to contain suspended nanoparticles. Been investigated. Based on the data analysis, the optimal conditions for the maximum amount of pollution inhibition were reported, so that a larger volume of nanoparticles was inhibited at lower voltages and higher pulse repetition frequencies.

Keywords: pulsed plasma, non-thermal plasma reactor (DBD), optimization, suspended nanoparticles, air pollution.

1. Nanotechnology Research Center, Nano-Physic Group, Physics Department, Urmia University, Urmia, Iran
2. Nanotechnology Research Center, Nano-Physic Group, Physics Department, Urmia University, Urmia, Iran
3. Department of Electrical and Computer Engineering, Buein Zahra Technical University, Buein Zahra, Qazvin, Iran

Investigating the radiography of copper nanoparticles and their production by electric wire explosion

Yaser Shafiei Dizeji[1], Mohammad Taghi Ahmadi[2], Hadi Goudarzi[3], Meisam Rahmani[4*]

Abstract

In addition to having electrical, optical and thermal conductivity characteristics, copper nanoparticles are used in fields related to health processes, medicine, nanosensors, diagnostic imaging and catalytic design and materials due to their antibacterial properties as well as high antifungal and antimicrobial activities. In this research, the radiography of copper nanoparticles and the synthesis of these nanoparticles using the electric explosion method with the ability to control their size, crystal structure and uniformity have been studied. Identifying copper nanoparticles and determining the approximate size of these nanoparticles with inexpensive X-ray imaging, as well as increasing the production speed of copper nanoparticles are among the goals of this research. Based on the obtained results, the amount of copper nanoparticles dispersed inside the solution, the clarity and width of the laser light path, and the color of the solution depend on parameters such as current and force or the power of the electric arc used. In the state of minimum current and power, the concentration of copper nanoparticles in the solution is less and its color is more transparent. Also, in this mode, the width of the laser light is at its lowest value. In the state of maximum current and power, the amount and concentration of copper nanoparticles dispersed inside the solution will be higher and the solution will take on a darker color. Also, the path of laser light is clearer and its width has its maximum value in this mode. In this research, according to the characterization of color and size in nanoparticles, the size of nanoparticles in the solution has been determined

Keywords: Copper nanoparticles, electric wire explosion, radiography, color and size characterization

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1. Nanotechnology Research Center, Nano-Physic Group, Physics Department, Urmia University, Urmia, Iran

2. Nanotechnology Research Center, Nano-Physic Group, Physics Department, Urmia University, Urmia, Iran

3. Nanotechnology Research Center, Nano-Physic Group, Physics Department, Urmia University, Urmia, Iran

4. Department of Electrical and Computer Engineering, Buein Zahra Technical University, Buein Zahra, Qazvin, Iran

Anti Fungi Fiber Felt Coating by Pulsed Electrospinning

Mohammad Taghi Ahmadi[1], Sepideh Pakniyakan[2], Meisam Rahmani[3*], Mahan Ahmadi[4]

Abstract

In Textiles used in human life can be a site for growth of many microorganisms such as bacteria, fungi, yeasts and algae, due to the presence of fat and dust spots on the fiber surface, which provides comfortable environment for the rapid growth of microorganisms and exacerbates. So, controlling the microbial and fungal population on textiles won’t be easy. In this research, preferred surface is coated by polystyrene fiber felt in the precense of copper nanoparticles. Pulsed electro spinning method for this purpose is developed in addition fabricated fiber felt treated by copper nanoparticles. Finally growth of penicillium fungi on the fabricated medium is tested and reduction of growth mechanism is observed.

Keywords: Antifungal, Copper nanoparticles, Electrospinning, Nano-fiber, Polystyrene.

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1. Department of Physics, Faculty of Science, Urmia University, Urmia, Iran
2. Department of Physics, Faculty of Science, Urmia University, Urmia, Iran
3. Department of Electrical and Computer Engineering, Buein Zahra Technical University, Buein Zahra, Qazvin, Iran
4. Medical Campos of Xi’an Jiaotong University, Xi’an, Shaanxi, China

Conductivity and semiconductivity of carbon nanotubes

Mohammad Mansouri, S. Taghi Mohammadi

Abstract

Carbon nanotubes are made of carbon plates with the thickness of one atom and in the shape of a hollow cylinder. It was discovered in 1991 by Samio Iijima (from NEC, Japan). Its special and unique properties, including high Young's modulus and good tensile strength on the one hand, and the carbon nature of nanotubes (because carbon is a light weight, very stable and simple material to carry out processes that are cheaper than metals to produce and It is an alternative) has made it witness important researches in the efficiency and electrical properties of nanotubes in the last decade. Many theoretical and practical works are also focused on the atomic structure and electronic structures of nanotubes. Extensive efforts have also been made to deal with mechanical properties including Young's modulus and tensile strength and the mechanism of defects and the effect of deformation of nanotubes on electrical properties. It can be said that this special interest in nanotubes originates from their unique structure and characteristics, including their electrical properties. In this article, it has been tried to focus on the conductivity and semiconductivity of carbon nanotubes and the electrical properties of carbon nanotubes and the method Distinguish between conductive nanotubes and semiconductors.

Synthesis and investigation of magnetic properties and absorption of electromagnetic waves in the X-band range by iron ferrite/active carbon nanocomposite

Mahsa Mahmoodi[1], Bagher Aslibeiki[2]*, Hamid Naghshara[3]

Abstract

Porous carbon decorated with Fe_3O_4 nanoparticles was successfully prepared by chemical co-precipitation method at 80°C. The structure, morphology and microwave absorption performance of Fe_3O_4/AC composite were investigated. Due to the porous structure of carbon obtained from elderberry kernels, Fe_3O_4/AC composite showed good microwave absorption performance. The minimum reflection loss value of -51.08 dB was obtained for the Fe_3O_4/AC composite at the frequency of 9.69 GHz in the X-band when the thickness is 1 mm. The excellent microwave absorption performance for Fe_3O_4/AC composites is rooted in impedance matching, large interfaces, ionic polarization, eddy loss, natural resonance, and multiple reflection and scattering. As a result, according to market applications and cost, Fe_3O_4/AC composite in this work can be a promising candidate for microwave absorber.

1. Faculty of Physics, University of Tabriz, Tabriz, Iran
2. Faculty of Physics, University of Tabriz, Tabriz, Iran
3. Faculty of Physics, University of Tabriz, Tabriz, Iran

Photocatalytic Degradation of Pharmaceutical Pollutants using Clinopetilolite Doped ZIF-67 Photocatalyst

Sogol Azimi[1*], Mohsen Mehdipour Ghazi[2]

Abstract

Clinoptilolite zeolite is widely used in photocatalytic processes due to its low cost and high porosity. Also, during our studies, it was found that ZIF-67, due to its low energy gap and high destructive power, is prone to be used as a photocatalyst to remove drug contaminants from the effluent. Therefore, in this study, the efficiency of clinoptilolite/ZIF-67 composite for photocatalytic degradation of drug contaminants was investigated. The composite was synthesized by the solvothermal method and characterized by XRD and DRS analysis. To evaluate the photocatalytic performance of composite, the photocatalytic removal of tetracycline as an organic contaminant of the model and the effect of operating parameters, including photocatalyst dosage, type of radiation source, and contaminant concentration was investigated by UV-visible spectroscopy. Under optimal conditions, A catalyst loading of 1.5 g/L resulted in 89% removal of tetracycline with the initial concentration of 20 ppm after 1 hour of exposure under visible light.

Keywords: Natural zeolite, Metal-organic framework, Drug contaminants, Photocatalytic Degradation.

1. Master student of Chemical engineering, Semnan University
2. Associate Professor, Department of Chemical Engineering, Semnan University

Nanocrystallization Behavior and Soft Magnetic Properties of FeSiBCu(C) Amorphous Alloy

Nahid Mohammadiparsa[1*], Safdar Habibi[2]

Abstract

Developing Fe-based nanocrystalline alloys with high saturation flux density (B_s) is essential for a wide range of technologies. In present work, effects of minor C addition as well as stress-relaxation treatment on nanocrystallization and magnetic properties of Fe-based amorphous alloys were systematically studied. For this reason, $Fe_{83.3}Si_4B_{12}Cu_{0.7}$ and $Fe_{82.3}Si_4B_{12}Cu_{0.7}C_1$ amorphous ribbons were produced by melt spinning process and were subjected to heat treatment at a temperature of 640 K for 1 hour. The crystallization temperatures were derived by DSC technique. Structural investigations performed at room temperature X-ray diffractometry confirmed amorphous nature of the as-spun ribbons and the presence of α-Fe nanocrystalline phases embedded in amorphous matrix in annealed ones. Using VSM technique, it has been found that although the addition of C decreases the value of B_s somewhat, the C-containing alloy still shows good magnetic properties, including relatively high B_s (133 emu/g) and low coercivity (0.3 G). The saturation magnetization of relaxed annealed samples increased significantly (153 emu/g and 184.5 emu/g for C-free and C-containing alloys, respectively) while H_c had a tendency to decrease. Improved soft magnetic properties after annealing could be attributed to the α-Fe nanocrystalline phases which were separated out, in addition to chemical rearrangement of atoms and annihilation of free-volume.

Keywords: Nanomaterials, Amorphous, nanocrystallization, magnetic properties, heat treatment

1. Department of Physics, Bu-Ali Sina University, Hamedan 65174-4161, Iran
2. Department of Physics, Bu-Ali Sina University, Hamedan 65174-4161, Iran

The development of a biocompatible nanocomposite patch to relieve stress on cracked bone tissue

Hoda Hoseini[1], Sara Daneshjou[2*], Mohammad Aminjafari[3], Aboulfazl Mirzapoor[4], Mahdi Fakoor[5]

Abstract

In this study, the design and analysis of a nanocomposite consisting of a matrix of biocompatible material and carbon nanotube fibers for strengthening cracks created on bone tissue is discussed. The topic of reducing stress intensity coefficients on damaged tissues can be a suitable approach to speed up bone healing and reduce the complications caused by cracking. In this article, a composite patch is designed from the combination of nanohydroxyapatite and carbon nanotubes and is made during the solvent casting process. By choosing crura bons as test samples and creating identical cracks, the critical load is calculated through the MMB test and the stress intensity coefficients are calculated by creating the corresponding finite element model. The aim of this study is to synthesize and find a nanocomposite with the best bone strengthening and healing properties, in such a way that by placing the patch on the crack, a substrate will be created that will accelerate the healing process of the crack by loading the crack site. The materials used in the design of the patch are such that in addition to strengthening, it also helps to speed up the repair of the crack. The efficiency of the designed composite patch is investigated by comparing the critical stress intensity coefficients by commercial stress analysis software, in the case of a bone fragment with and without a patch.

Keywords: Nanocomposite, Hydroxyapatite patch, Nanotube carbon, Bone tissue reconstruction and repair

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1. Department of Nanobiotechnology, Faculty of Biological Science, Tarbiat Modares University, Tehran, Iran
2. Department of Nanobiotechnology, Faculty of Biological Science, Tarbiat Modares University, Tehran, Iran
3. Faculty of New Sciences and Technologies, University of Tehran, Tehran, Iran
4. Department of Nanobiotechnology, Faculty of Biological Science, Tarbiat Modares University, Tehran, Iran
5. Faculty of New Sciences and Technologies, University of Tehran, Tehran, Iran

Wound dressings using biological nanoparticles

Marziyeh rahmiyan

Abstract

Today, wound repair is intensively studied to become an "ideal" technique with rapid healing, minimizing scarring, and ensuring functional preservation. (2) Nanotechnology studies materials (with a minimum diameter of one dimension between 1 and 100 nm) and phenomena related to these materials. Nanomaterials can be divided into three categories: 1. Nanosurfaces (with one nanometer dimension), 2. Nanowires or nanotubes (nanometer dimension) 3. Nanoparticles (with three nanometer dimensions) were divided. Among the different types of nanoparticles, metal nanoparticles (such as silver, gold, zinc) are routinely used in dermatology due to their beneficial effect in accelerating wound healing and treating and preventing bacterial infections. Metal nanoparticles in wound dressings have provided a new generation of modern wound dressings.

Investigating the preservation ability of mesenchymal stem cells derived from adipose tissue cultured on pan scaffold under the influence of nicotinamide

Yekta Setayeshnia, Reyhane Taghizadeh

Abstract

Stem cells are the building blocks of the human body. The stem cells inside the fetus eventually become the cells, tissues and organs of the fetus' body. To use stem cells, they must be cultivated on a suitable scaffold and under good conditions. Today, among polymers, polyaniline (PANi) is one of the most attractive conductive polymers with high chemical stability due to its high conductivity as well as biocompatibility. In addition to using 3D scaffolds, some compounds also cause the development of these cells. Among these, we can mention nicotinamide, which is the subject of this research.

In this research, first, mesenchymal stem cells were extracted from adipose tissue and cultured. Then the cells were cultured and transplanted on the PAN scaffold with nicotinamide. The results were evaluated by the cell counting method and the evaluation of the proliferation rate, the colonization rate in the metocalt medium, the apoptosis rate of the cells by flow cytometry and the scaffold toxicity by the MTT method.

In this study, it was observed that the addition of nicotinamide to the PAN scaffold increased the number of cells by 5.6 times and TNC by 6.5 times and the least amount of apoptosis of mesenchymal cells, which confirms the better living conditions in the presence of nicotinamide. There was a 3-fold increase in CFU results, mesenchymal cells with scaffold and nicotinamide

Keywords: PAN scaffold, adipose mesenchymal stem cell, nicotinamide, flow cytometry, MTT

Applications of nano-bioglass in tissue engineering

Elham Zendedel[1]* Shiva Asadpour[2]*

Abstract

A bioactive implant that encourages bone regeneration is called Bioglass®. In an aqueous environment, this material experiences a series of surface reactions that lead to the formation of a surface layer of hydroxycarbonate apatite (HCA). The formation of this layer and the release of soluble silica are responsible for the adhesion and proliferation of osteoblasts on the glass surface. It has been shown that Particulate Bioglass® significantly reduces oral microbes, especially those connected to periodontal and caries diseases. The antibacterial characteristic of Bioglass® may aid to reduce the risk of bacterial colonisation when it is used in periodontal applications. Nano-bioceramic particles like nano-bioglass (nBG) were inserted into the scaffold to form a biomimetic scaffold that closely resembles the extracellular matrix of bone. Scaffolds with nBG are preferable for orthopaedic and periodontal tissue engineering applications, claim various research.

Keywords: Tissue Engineering, Nanobioglass, Nano-bioceramic particles, Biomimetic, Nano-bioceramic

1. Department of Tissue Engineering and Applied Cell Sciences, School of Advanced Technologies, ShahrekordUniversity of Medical Sciences, Shahrekord, Iran
2. Department of Tissue Engineering and Applied Cell Sciences, School of Advanced Technologies, ShahrekordUniversity of Medical Sciences, Shahrekord, Iran

Nano-aptasensors for the detection of microbial secondary metabolites

Mona sadat Mirtaleb[1], Behnaz Bakhshandeh[2]

Abstract

Microbes and their metabolites can be both friends and foes for human health. With the help of nanotechnology, artificial intelligence, and molecular docking, nanosensors with high potential have been designed and used to detect bacteria and their metabolites in food and water for medical and industrial applications. Nano-sized sensors are biological diagnostic molecules that can sense analytes in the concentration range of ppb (µg/L). Among them, aptamers as short oligonucleotide sequences of ssDNA or RNA, are designed and synthesized as probes in the identification and detection of metal ions, small molecules, proteins, cancer cells, bacterial cells, and their derivatives by the systematic evolution of ligands by exponential enrichment method. Aptasensors provide the ability of molecular screening with their specificity, ease of activation and cost benefit large-scale production. Due to the high sensitivity, fast detection, and high efficiency of aptasensors, the possibility of measuring pathogenic bacteria and microbial metabolites in low concentrations and in a short time is considered as a new approach. This article reviews the latest researches and developments on detecting secondary microbial metabolites using aptamer-based biosensors.

Keywords: Biosensors; aptamer; microbial secondary metabolites;

1. Department of Microbial Biotechnology, School of Biology, College of Science, University of Tehran, Tehran, Iran
2. Department of Biotechnology, College of Science, University of Tehran, Tehran, Iran

Chitosan functionalized magnetic Fe_3O_4 nanoparticles for controlled release of the doxorubicin

Parva Soltany[1]*, Mahsasadat Miralinaghi[2], Farshid Pajoum Shariati[3]

Abstract

In this research, chitosan-functionalized magnetic Fe_3O_4 nanoparticles (MCS) were chemically synthesized. Due to their magnetic feature and sensitivity to pH, MCS was used as a carrier for the loading and targeted release of the anticancer drug doxorubicin (DOX). The MCS was then characterized by Fourier transform infrared spectroscopy (FT-IR) and X-ray diffraction (XRD). The drug release rate from DOX-loaded MCS was measured at pH = 7.4 (blood) and pH = 5.6 (cancer cells). The results showed that this approach has the potential to reduce the side effects of chemotherapy.

Keywords: Magnetic nanoparticles, chitosan, targeted drug delivery, anticancer drug

1. Department of Chemical Engineering, Science and Research Branch, Islamic Azad University, Tehran, Iran
2. Department of Chemical Engineering, Science and Research Branch, Islamic Azad University, Tehran, Iran
3. Department of Chemistry, Faculty of Science, Varamin - Pishva Branch, Islamic Azad University, Varamin, Iran

Hydrophilic behavior of Graphdiyne Nanotube from SCC-DFTB and Car-Parrinello Molecular Dynamics Simulation

Fatemeh Houshmand[1], ran Friedman[2]

Abstract

Graphdiyne nanostructures have been considered due to the predictions of quantum calculations regarding the occurrence of special electronic and structural features before the synthesis of these structures. We study the hydrophobic/hydrophilic behavior of GDNT using molecular dynamics simulations. The energetics of the carbon-water interface are mainly dispersive but in the present study augmented with a carbon quadrupole term acting on the charge sites of the water. The simulations indicate that this contribution is negligible in terms of modifying the structural properties of water at the interface. Simulations of GDNTs in water display a wetting and drying of the interstice between the GDNT depending on their initial spacing. Thus, initial tube spacing's of 7 and 8Å resulted in a drying of the interface whereas spacing of>9 Å remain wet during the course of the simulation.The results showed that water molecules do not enter into small-diameter nanotubes and aggregate in the walls, and this is due to the hydrophobic property of smaller carbon nanotubes, while the larger nanotubes do not show this feature. Also, the positive effect of pressure at the constant temperature on the aggregation of water molecules inside Graphdiyne nanotubes (2,0) was observed.

Keywords: Nano-material, Graphdiyne, Graphdiyne nanotubes, Density functional theory, SCC-DFTB.

1. Department of Industrial Chemistry engineering, Technical and Vocational University, Tehran, Iran.

2. Computational Chemistry and Biochemistry Group, Centre for Biomaterials Chemistry, Linnaeus University, Sweden

Numerical study of the effect of active layer thickness in the presence of cylindrical nanoparticles on the short circuit current density and absorption of organic solar cells

Zahra moradpour[1], Nasrin sepahvand[2], Mohsen bahrami[3]

Abstract

The present study deals with the effect of the presence of cylindrical aluminum nanoparticles on the parameters of short circuit current density and absorption in the active layer of **ITO/PEDOT:PSS/P3HT:PCBM/ZnO/Al** organic solar cell by means of the Finite-Difference Time-Domain (FDTD) method. The nanoparticles are located in a hexagonal pattern inside the P3HT:PCBM layer and on its border with ZnO. During the simulation, the AM1.5 standard sun spectral pattern has been used in the spectral range of 300-1200 nm. Calculations have shown that the presence of nanoparticles causes a considerable improvement in the values of the parameters. This increase is especially noticeable in the range of high wavelengths. Given the results, when the nanoparticle height is changed, the optimal thickness is also changed, where the short circuit current density and the absorption have the highest values, in a way that at the heights of 50, 100 and 150 nm for nanoparticles, the P3HT:PCBM layer is optimal in the thicknesses of 150, 200 and 250 nm. These results are independent of the radius of nanoparticles.

1. Department of Physics, Lorestan University, Khorramabad
2. Department of Physics, Shahid Chamran University, Ahvaz
3. Department of Physics, Lorestan University, Khorramabad

Numerical study of the effect of aluminum-gold nanorods on short current density and absorption in organic solar cells

Zahra moradpour[1], Nasrin sepahvand[2], Mohsen bahrami[3]

Abstract

Using the finite difference method in the time domain, the present study deals with the effect of the presence of aluminum and gold nanorods on the quantities of the short circuit current density and the absorption in the ITO/PEDOT:PSS/P3HT:PCBM/ZnO/Al organic solar cell. The nanorods, made of an aluminum cylinder and two golden caps, are located in a hexagonal pattern inside the P3HT: PCBM layer and at the border with ZnO. During the simulation, the standard spectral pattern of the sun AM1.5 has been used in the spectral range of 300-1200 nm. Calculations have shown that the presence of nanorods significantly improves the values of the aforementioned quantities. This is especially noticeable in the range of high wavelengths. According to the results, when the height of the nanoparticles changes, one can see changes in the optimal thickness of the highest short-circuit current density and the absorption in a way that the P3HT:PCBM active layer is optimal in thicknesses of 150, 200, and 250 nm at nanorod heights of 50, 100, and 150 nm, respectively. The calculations in different conditions show that the short-circuit current density and the absorption under the optimal thickness of the active layer is 150 nm, the height of the cylinder is 50 nm, the radius of the cylinder is 20 nm, and the curvature radius of both caps is4 nm.

1. Department of Physics, Lorestan University, Khorramabad
2. Department of Physics, Shahid Chamran University, Ahvaz
3. Department of Physics, Lorestan University, Khorramabad

Dichalcogens of transition metals as a substitute for commercial platinum in the cathode of polymer fuel cells

Ali bahari [1], Mahdi soleimani moghaddam[2], Hajar rajaei litkouhi[3]

Abstract

Tungsten disulfide with excellent structural features, including good electrical conductivity and a layered structure with multiple defects, has excellent catalytic performance and high stability as a suitable electrocatalyst for the oxygen reduction reaction. Nowadays, the production of catalysts with suitable oxygen reduction reaction activity and reasonable price is still one of the big challenges facing the electrocatalyst industry. In this research, reduced graphene oxide/ Tungsten disulfide (WS2/RGO) nanosheets have been synthesized by hydrothermal method. Characterization analyzes such as X-ray diffraction spectrum, scanning electron microscopy and EDX showed the successful synthesis of WS2/RGO nanocomposite. The results of the electrochemical experiments showed that the WS2/RGO nanostructure has remarkable electrocatalytic performance, including a high current density that is almost equal to that of platinum, and it can also exhibit charge transfer similar to that of platinum. In addition to the mentioned items, this nanocomposite exhibited very good stability over long periods of time.

Therefore, the obtained results show that WS2/RGO nanocomposite can be used as an inexpensive and highly efficient electrocatalyst for ORR activity in electrocatalytic applications such as fuel cells, lithium ion batteries, supercapacitors, etc..

Keywords: LSV, Stability, WS_2, fuel cell

1 Corresponding Author(full professor at Mazandaran university)
2 Corresponding Author(Condensed matter PhD candidate at Mazandaran university)
3. (Assistant professor at Amol university of special modern and technology university)

ynthesis and study of structural and optical properties of g-C_3N_4 and g-C_3N_4/Fe_3O_4 nanocomposite

Sahar Ziamolki[1]; Bagher Aslibeiki[2]; Mahmoud Zarei[3]

Abstract

In this research, according to the increasing need in the field of degradation of dyes and drugs in photocatalytic applications, environmental water purification has been done to prepare g-C_3N_4/Fe_3O_4 nanocomposite. These two composites have unique electrical and optical properties due to the presence of g-C_3N_4 (graphitic carbon nitride) as a polymer semi-counductor. The same synthesis of this material together with the chemical formula of nanoparticles of spinel ferrites is used in photocatalytic fields. Because Ferrite Magnets (Fe_3O_4) are one of the most important and widely used magnetic materials, which has received a lot of attention to scientific research experiments, which has features such as suitable biocompatibility and easy separation due to its relatively high magnetization. Here, we investigate the structural and optical properties of these nanocomposites, which are characterized by scanning electron microscope, and photo luminescence spectrum respectively, and the results show that nanocomposite g-C_3N_4/ Fe_3O_4 has better properties than g-C_3N_4. Also, VSM analysis was used to check the amount of changes in magnetic behavior of nanocomposite.

Keywords: Synthesis, structural properties, optical properties, nanocomposite

1. Faculty of Physics, University of Tabriz, Tabriz, Iran
2. Faculty of Physics, University of Tabriz, Tabriz, Iran
3. Department of Applied Chemistry Faculty of chemistry, University of Tabriz, Iran

A Review on the Formation of Nano-Structures in High Entropy Alloys by Using Severe Plastic Deformation

Mehdi Montazeri-Pour[1], Fatemeh-Zahra Chegeni[2]

Abstract

High-entropy alloys have a wide range of mechanical properties. In numerous high-entropy alloys, special properties such as high yield strength, resistance to fatigue, high fracture toughness, and excellent ductility are evident. In general, it is difficult to simultaneously apply several new strengthening mechanisms for a bulk material that itself has high strength; however, this work can be performed by using severe plastic deformation (SPD) processes. In general, one way to increase strength in alloys is to refine grains using SPD techniques. One of the important features of applying SPD to high-entropy alloys is that it is possible to obtain second-phase nanoparticles in the alloy matrix with a grain size of several tens of nanometers. Therefore, SPD induces phase transformation and increases strengthening mechanisms of high entropy alloy (HEA) by forming nano-precipitates, new grain boundaries and ultrafine grain (UFG)/nanograin (NG) bands. For example, SPD has caused the nano-structuring of $Fe_{35}Mn_{35}Co_{10}Cr_{10}Ni_{10}$ alloy and the formation of grains smaller than 30 nm in this alloy. In this work, through a review of recent researchers' studies, a report on the formation of nanostructures in high-entropy alloys using the SPD methods has been provided to characterize the effects of SPD utilizing on microstructural evolutions, phase transformations, and mechanical properties of these alloys.

Keywords: High-entropy alloys, Severe plastic deformation, Mechanical properties, Microstructural analysis, Nanostructured materials

1. Assistant Professor, Department of Chemical and Materials Engineering, Buein Zahra Technical University, Buein Zahra, Qazvin, Iran
2. M.Sc. Student, Department of Materials Engineering, Hamadan University of Technology, Hamadan, Iran

An overview of the properties, synthesis methods and applications of gold nanoparticles

Mehdi Montazeri-Pour[1], Mohammad-Mehdi Doulati [2], Amir-Hossein Zeinalipour [3]

Abstract

Gold is a soft metal, yellow in color, and a good conductor. However, the properties of this metal, such as optical, electrical, and physicochemical properties and surface plasmon resonance effect, can be varied by changing the characteristics of its particles, such as shape, size, aspect ratio, or surrounding environment; so that if particles size of gold decreases down to nano dimensions, it will show new and different properties. The ease of synthesis, functionalization, and attachment of biomolecules to gold nanoparticles has led to its numerous applications in various biomedical fields, including biosensors, tumor targeting for cancer treatment, targeted drug delivery, imaging, photothermal and photodynamic treatments. The unique properties of gold nanoparticles have led to their widespread use as chemical and biological sensors with enhanced performance. These properties include tunable surface plasmon resonance, distance-dependent fluorescence decrease or enhancement, high electrical conductivity, and exceptional light scattering properties. Gold nanoparticles can be synthesized in various ways, which fall into three categories: physical, chemical, and biological. Factors such as the controllable size, distribution, morphology, crystallinity, shape, and properties of particles, as well as their production from various raw materials, play essential roles in the selection of the appropriate synthesis process. Although chemical and physical methods are more famous for the synthesis of nanoparticles, the use of toxic chemicals limits their biomedical applications, especially in clinical fields. In this work, a review of the properties and common methods of synthesis of gold nanoparticles has been performed, and the potential applications of these nanoparticles in various fields have been briefly studied.

Keywords: Gold nanoparticles, Nanostructured materials, Optical properties, Sensors, Synthesis.

1. Assistant Professor, Department of Chemical and Materials Engineering, Buein Zahra Technical University, Qazvin, Iran
2. B.Sc. Student, Department of Chemical and Materials Engineering, Buein Zahra Technical University, Qazvin, Iran
3. B.Sc. Student, Department of Chemical and Materials Engineering, Buein Zahra Technical University, Qazvin, Iran

A review of theoretical models of strength and elastic properties of nanocomposites fabricated by FDM technique

Mohammad Hossein Fahimi , Mohsen Mohammadi

Abstract

One of the challenges of the 3D printing process is the poor mechanical properties of the products prepared with this method compared to conventional manufacturing techniques. The use of nanocomposites is an effective and useful way to improve the mechanical properties of products prepared with this technique. Therefore, in this article, while investigating the effect of nanoparticles on the physical and mechanical properties of polymers used in the FDM process, theoretical models have been studied in order to model the properties.

Keywords: 3D printing, fusion deposition modeling, nanocomposite, mechanical properties

The shape memory effect of PLA/PCL blends

Mohammad Hossein Fahimi[1], Mohsen Mohammadi[2]

Abstract

To solve resource and environmental issues, replacing materials derived from petroleum with renewable polymers is a helpful solution. Polylactic acid and polycaprolactone as two biodegradable polymers have wide applications in medicine. Therefore, their blend shows appropriate biocompatibility and biodegradability. The main purpose of preparing this blend is to improve the toughness of PLA, but in addition to this, the shape memory properties of this blend are also significant, which are influenced by several parameters. This article reviews the effect of different parameters on the shape memory effect of the PLA/PCL blend.

Keywords: Polymer blends, Shape memory effect, Polylactic acid, Polycaprolactone

1. Department of Chemical Engineering, Polymer Engineering Group, University of Tehran, Tehran, Iran.
2. Department of Polymer Engineering, Faculty of Engineering, Qom University of Technology, Qom, Iran.

Synthesis of biological metal-organic framework by biomineralization method for the delivery of 5-FU

F.Jamali[1] , M.Tohidi[2*] , B.Rastegari[3]

Abstract
In the current research, inspired by the biomineralization process, a biological metal-organic framework (BioMOF) was created for the protection, encapsulation and controlled release of 5-FU drug. For this purpose, biocompatible nanoporous metal-organic framework based on sulfonamide was synthesized as a carrier for the delivery of 5-FU drug in the presence of protein in aqueous medium at room temperature. Some characterization techniques such as scanning electron microscope (SEM) and Fourier-transform infrared spectroscopy (FTIR) were used. In the end, the MTT method was used to investigate the toxicity of the synthesized composite. The obtained results showed that the protein/5-Fu@BioMOF can be effective for the cancer therapy.
Keywords: Biological metal organic framework (BioMOF), Fluorouracil(5-Fu), Biomineralization and cancer therapy.

1. Department of NanoChemical Engineering - Shiraz University,Shiraz, Iran
2. Department of NanoChemical Engineering - Shiraz University,Shiraz, Iran
3. Department of the of Diagnostic Laboratory Science and Technoloy Research Center Shiraz University of Medical Science , Shiraz, Iran

Ultrasonic-assisted synthesis of g-C_3N_4/Clinoptilolite composite: Efficient adsorption of methylene blue

Hajar Farhadi[1], Narjes Keramati[2]*

Abstract

The adsorption method is one of the methods used due to its high efficiency, low cost, convenience and simplicity. In the present research, Graphitic carbon nitride/clinoptilolite (g-C_3N_4/CP) was synthesized based on the ultrasonic method. Typicaly, 16 g of urea was stirred in 50 cc of deionized water for 15 min. Then 1 g of Clinopetilolate was added to the above solution and subjected to ultrasonic for 30 min. The solution was dried in an oven at 80°C for 12 hr and finally calcined in the oven at 550°C for 2 hr. The XRD pattern of the g-C_3N_4/CP composite and the FT-IR spectrum show that the composite is correctly synthesized. Adsorption of methylene blue (5 ppm) by synthesized composite (0.3 g/l) was invesitigated for 180 min. Methylene blue absorption efficiency for bulk g-C_3N_4 and g-C_3N_4/CP composite was 16.3 and 60.9%, respectively, and the absorption capacity was 0.47 and 2.23 mg/g. The presence of clinoptilolite has improved the methylene blue absorption performance.

Keywords: Adsorption, Clinoptilolite, Graphitic carbon nitride, Methylene blue, Sonochemistry

1. Master's student, Department of Chemical Engineering, Faculty of Nanotechnology, Campus of New Sciences and Technologies, Semnan University, Semnan, Iran
2. Assistant Professor, Department of Nanotechnology, Faculty of New Sciences and Technologies, Semnan University, Semnan, Iran

Reduction of electron/hole recombination in Z-scheme photocatalysts

Tala Jalalian[1], Narjes keramati[2], Narges Fallah[3]

Abstract

Energy issues and the development of environmentally friendly technologies are importance. As a new green technology, semiconductor photocatalysts need as input, a suitable semiconductor and solar energy. The photocatalysts process, using semiconductors for effective use of solar energy in reducing water to produce hydrogen, converting carbon dioxide into chemical fuels and destroying pollutants to improve the environment has received much attention. Charge separation and electron transfer is the most important and basic step in photocatalytic processes and determines the efficiency of the photocatalyst, which depends on the energy level position of the valence and the conduction layers, relative to the reduction potential of the particles adsorbed on the catalyst. If e^- and h^+ are not trapped quickly after excitation, they combine in picoseconds. One of the methods to prevent the production electron/hole recombination is to direct the electron and hole to the other catalyst surface. This is done using Z-design photocatalysts, which are a biological mimic of the natural photosynthesis process. The mechanism of the Z-scheme is the formation of a heterogeneous pair of two or more photocatalysts in such a way that the electron/hole oxidation/reduction potentials are maintained at a higher capacity than the individual units. A Z-scheme with excellent photocatalytic activity has multiple capabilities, including 1- Simultaneous preservation of oxidation and reduction abilities, 2- Spatial separation of oxidation and reduction active species, 3- Ability to separate charge carriers with strong oxidation power, 4- A wide range of photocatalysts for specific photocatalytic reactions. and 5- increases the range of light collection.

Keywords: Electron/hole production, Z-scheme photocatalysts, recombination

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1. M. Sc. Student of Chemical Engineering, Department of Nanotechonology, Faculty of New Sciences and Technologies, Semnan University, Semnan

2. Assistant Professor of Chemical Engineering, Department of Nanotechonology, Faculty of New Sciences and Technologies, Semnan University, Semnan

3. Associate Professor of Chemical Engineering, Department of Biotechnology - Environment, Amirkabir University of Technology, Tehran

Synthesis and Performance Evaluation of Iron Oxide/Chitosan Nanobiocomposite in Disperse Dye Coagulation

Zahra mohammadi[1], Narjes keramati[2]

Abstract

Textile industry is one of the biggest water consuming industries and produces a lot of wastewater.With the entry of colored substances into the water environment due to their effect on reducing light penetration, it causes a disturbance in photosynthesis, and on the other hand, there is a risk of these substances entering the human food chain.The most common pretreatment methods for removing textile dyes and dyeing include physical-chemical methods such as coagulation and flocculation, electrocoagulation. The effectiveness of coagulation of dyes can be increased by appropriate selection of coagulants and optimization of process parameters such as initial pH, dose of coagulant/coagulant aid, settling time, coagulation time, etc. The aim of this study is the synthesis and application of iron oxide/chitosan nanobiocomposite in the coagulation of blue disperse dye. The synthetic sample was identified by XRD and FTIR characterization analyzes and the correctness of its synthesis was confirmed. Its performance in the coagulation of blue disperse dye (ppm 40) at different pH was investigated using 0.05 g/L of synthetic coagulant. Fast mixing, slow mixing, and settling time were considered to be 3, 15, and 30 minutes, respectively. Coagulation efficiency of the mentioned dye at pH 4, 7 and 9 was obtained as 91.9, 79.1 and 85.7% respectively. The results indicate that hybrid coagulants combine the positive aspects of their individual components and lead to improved treatment efficiency.

Keywords: Iron Oxide, Chitosan, Coagulant

1. M. Sc. Student of Chemical Engineering, Department of Nanotechonology, Faculty of New Sciences and Technologies, Semnan University, Semnan
2. Assistant Professor of Chemical Engineering, Department of Nanotechonology, Faculty of New Sciences and Technologies, Semnan University, Semnan

Production and evaluation of anticancer effects of nanoemulsion containing caffeine

Ayoob Amirizadeh[1]*, Sanaz Sheikhzadeh[2], Nowruz Delirezh[3]

Abstract

Cancer is one of the problems of today's societies which can involve people of different ages and even lead to death One of the types of cancer that can cause these problems is blood cancer (leukemia) which is divided into different types. The chronic myeloid type (CML) causes changes in the stem cells in the bone marrow which leads to excessive production of abnormal white blood cells When these abnormal cells enter the bloodstream, the result is CML. In this study, nanoparticles were used as a suitable method for better and effective delivery of caffeine in order to investigate the treatment of this type of cancer.

Nanoparticles containing caffeine were prepared by single-phase oil-in-water emulsion method. The physical and chemical properties of produced nanoparticles were evaluated. K562 cancer cells were cultured in standard cell culture conditions and then they were treated with different concentrations of caffeine nanoparticles (5, 4, 3, 2, 1, 0.5, 0 mM) and the survival rate of cancer cells was investigated.

Nanoparticles with appropriate physical and chemical properties, including particles with uniform size distribution and encapsulation efficiency of 76.1 ± 0.8% were obtained. Also, the results showed that caffeine nanoparticles have significant cytotoxic effects on leukemia cells and in the future, following more studies, these nanoparticles can be used as anti-cancer drugs.

keywords: Leukemia, Nanoparticles, caffeine, Encapsulation Efficiency

1. Department of Microbiology, Faculty of Veterinary Medicine, Urmia University, Urmia, Iran.
2. Department of Microbiology, Faculty of Veterinary Medicine, Urmia University, Urmia, Iran.
3. Department of Microbiology, Faculty of Veterinary Medicine, Urmia University, Urmia, Iran.

Solvothermal synthesis of zeolite imidazole framework (ZIF-67) and overall characterization

Sogand Aghamohammadi[1], Mohsen Mohseni[2], Sajjad Abbasi[3], Sahar Rezaei[4], Alireza Hosseinzadeh[5], Yavuz Aydemir[6], Yasaman Fallahi[7], Utku Burgun[8], Gamze Gümüşlü Gür[9], Alper Sarıoğlan[10]

Abstract

As a new class of metal–organic frameworks (MOFs), zeolitic imidazolate frameworks (ZIFs) that consist of transition-metal cations (M) and imidazole-based ligands (lm) are increasingly investigated.

ZIF-67, also known as 2-methylimidazole cobalt salt, is a zeolitic imidazolate framework that serves as the MOF structure ($C_8H_{10}N_4Co$). They play a significant role in the study of nanomaterials and give a wealth of architectures and exceptional variability thanks to a variety of metal nodes, functional linkers, and enclosed substrates. In this paper complete characterization including XRD, FESEM, EDAX dor mapping, BET-BJH and TGA for ZIF-67 has been carried out which can be taken in to account in various applications.

1-5. Department of Chemical Engineering, Faculty of Engineering, Azarbaijan Shahid Madani University, P.O. BOX 5375171379, Tabriz, Iran

6-10. Department of Chemical Engineering, Istanbul Technical University, Maslak 34469, Istanbul, Turkey

Detailed Characterization of Plasma-Treated ZIF-67 Carbonized at Various Temperatures

Sogand Aghamohammadi[1], Mohsen Mohseni[2], Sajjad Abbasi[3], Sahar Rezaei[4], Alireza Hosseinzadeh[5], Yavuz Aydemir[6], Yasaman Fallahi[7], Utku Burgun[8], Gamze Gümüşlü Gür[9], Alper Sarıoğlan[10]

Abstract

Transition metals (group VIII) like cobalt (Co), iron (Fe), nickel (Ni), and ruthenium (Ru) have been identified as being effective catalysts for several reactions. It would be ideal to create a different technique for making highly active metal catalysts with the appropriate porous structure and enhanced active metal dispersion. Metal organic frameworks (MOFs) are a class of microporous crystalline polymers made up of a metal and an organic ligand. They have a high surface area and porosity and can be used in a wide range of applications, including gas storage and separation, chemical sensing, heterogeneous catalysis, bioimaging, drug delivery, and luminescence. When the pyrolysis circumstances are ideal, the reducibility of cobalt nanoparticles can be further improved. High metal loading, effective active phase dispersion, and encapsulation produce a very high activity and strong stability. One of the most popular MOFs employed in this context is the nitrogen-rich ZIF-67 due to its unique properties. They produce carbon-encapsulated cobalt nanoparticles when pyrolyzed in an inert atmosphere, which prevent the production of larger agglomerates and favour the dispersion of cobalt particles. In the presented research, along side carbonization temperature, plasma treatment effect on the catalyst characteristic was studied.

Keywords: zeolite imidazole framework(ZIF-67), Plasma, characterization, carbonization

1-10. Department of Chemical Engineering, Faculty of Engineering, Azarbaijan Shahid Madani University, P.O. BOX 5375171379, Tabriz, Iran

Morphological Characterization of Nano- Structure Plasma-assisted Pyrolyzed ZIF-67

Sogand Aghamohammadi[1], Mohsen Mohseni[2], Sajjad Abbasi[3], Sahar Rezaei[4], Alireza Hosseinzadeh[5], Yavuz Aydemir[6], Yasaman Fallahi[7], Utku Burgun[8], Gamze Gümüşlü Gür[9], Alper Sarıoğlan[10]

Abstract

the high-temperature step required in the carbonization of organic precursors frequently impacts the distribution of the active phase, especially when high loadings are predicted. Metal-organic frameworks (MOFs) are a class of promising porous crystalline inorganic-organic hybrid materials that have appeared as one of the most rapidly developing fields in materials science and chemistry over the last two decades. MOFs have recently been presented as remarkable precursors in synthesizing amazingly distributed Co and Fe nanoparticles with fascinating performance in terms of activity, reactivity, and stability to solve the drawbacks of previous technologies. Because of its intriguing properties, nitrogen-rich ZIF-67 is one of the most commonly used MOFs in this context. When pyrolyzed in an inert atmosphere, they produce carbon-encapsulated cobalt nanoparticles that inhibit the formation of larger agglomerates, favouring cobalt particle dispersion. Furthermore, when the pyrolysis conditions are optimized, the reducibility of cobalt nanoparticles can be increased even further. In the presented research, morphological characterization of plasma-assisted pyrolyzed ZIF-67 will be taken in to account.

Keywords: zeolite imidazole framework(ZIF-67), Plasma, Morphology, carbonization

1-10. Department of Chemical Engineering, Faculty of Engineering, Azarbaijan Shahid Madani University, P.O. BOX 5375171379, Tabriz, Iran

The effect of different parameters on solid lipid nanoparticles' size for use in targeted drug delivery

Raheleh Shabani[1*], Zahra Beagom Mokhtari-Hosseini[2], Ashrafalsadat Hatamian-Zarmi[3], Mohammadreza Abbaspour[4]

Abestract

Nanotechnology is very important in many fields such as pharmaceuticals and biomedicine. In recent years, a lot of attention has been paid to drug nanocarriers, because these nanocarriers can act very effectively as a drug delivery system due to controlling the drug release rate and increasing the therapeutic efficiency. Studies have shown that some of the oral tablets on the market, due to first-pass metabolism, have a relatively slow onset of action, showing only a small percentage of oral bioavailability and a relatively short half-life of about 3 to 5 hours. Hence, the best way to deliver drugs with poor pharmacokinetic parameters is to use nanotechnology. Considering the importance of solid lipid nanoparticles and their unique characteristics, in this research, the effect of changing several factor (temperature, stirrer shape, homogenizer power and surfactant amount) on the size of these nanoparticles is investigated in order to be used in targeted drug delivery.

Keywords: drug delivery, bioavailability, solid lipid nanoparticles, nanocarriers

1. MSc Student, chemical Engineering Department, Hakim sabzevari International University
2. Chemical Engineering Department, Faculty of Petroleum and Petrochemical Engineering, Hakim Sabzevari University, Sabzevar, Iran
3. Department of Life Science Engineering, Faculty of New Science and Technology, University of Tehran, Tehran, Iran
4. Department of Pharmaceutics, School of Pharmacy,Targeted Drug Delivery Research CenterMashhad University of Medical Sciences, Mashhad, Iran

Investigating of the electromagnetic absorption properties of $ZnFe_2O_4$/RGO nanocomposite in the X-band.

Rogayye Ebadi[1]

Abstract

Zinc ferrite nanoparticles with reduced graphene oxide were synthesized by coprecipitation method and its structural and electromagnetic properties and morphology was investigated. From the investigating of structural properties of the prepared nanocomposite an inverted spinel structure was obtained. Although, from the results of the FE-SEM images, reduced graphene oxide sheets were clearly observed for different scales. From checking of the electromagnetic properties with network analyzer in the X-band range, strong microwave absorption performance was obtained for the prepared nanocomposite, and the highest reflection loss value was -38dB at the frequency of 8.8GHz for the thickness of 3.2mm. The strong microwave absorption performance of the prepared nanocomposite is due to the strong impedance matching, strong microwave damping, natural resonance, eddy current losses, which causes the effective uses of the desired nanocomposite as a material to absorb microwaves.

1. Msc-student -Tabriz University

Effects of hydrogels based on lipid-based nanoparticles (LNPs) in the treatment of glioblastoma: A systematic review, meta-analysis and meta-regression

Ahmad Fatahi-Vanani[1]

Abstract

Introduction: Glioblastoma (GBM) is the most common malignant brain tumor in adults. Among all types of cancer, glioblastoma is more resistant to chemotherapy and radiation therapy. Treatment of this disease is difficult due to its malignancy, rapid progression, and high resistance to anticancer drugs. Considering the high resistance of glioblastoma tumor to chemotherapy and radiotherapy and the impracticality of complete tumor removal by surgery due to the invasive nature of the tumor, a new attention and attitude towards nanomedicine has been created. The present study is a systematic review, meta-analysis and meta-regression study with the aim of investigating the effects of hydrogels based on lipid-based nanoparticles (LNPs) in the treatment of glioblastoma

Materials and methods: In this study, searching was conducted in Scopus, Web of science, Pubmed, PLUS ONE and Google Scholar search engines. In the search of keywords such as lipid-based nanoparticles, glioblastoma, Hydrogel along with their Mesh terms, were done without time limit. The search was done according to the PRISMA protocol. ARRIVE and CRIS checklists was used to check the quality of compliance. Egger's Test of the Intercept was used to check publication bias.

Results: After searching, 139 articles were found. Out of the 139 articles found, 8 articles were removed due to duplication, out of the remaining 131 articles, 115 articles were removed due to irrelevance and 10 articles were removed due to lack of access to the full text of the article, so finally 6 studies were included in the meta-analysis process.

Conclusion: Hydrogels based on lipid-based nanoparticles (LNPs) cause drug specificity in better targeting of cancer cells for glioblastoma treatment. Also, these hydrogels cause controlled and long-term drug release in the target tissue.

Keywords: drug delivery, lipid-based nanoparticles, glioblastoma, hydrogel

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1. Student Research Committee, Shahrekord University of Medical Sciences, Shahrekord, Iran.

The Effect of Experimental Setup on Biosynthesized Silver Nanoparticles with Plasma and Ocimum Basilicum L. Extract

Fariborz Heidary[1], Mohammad Ali Mohammadi[2], Fatemeh Baharlounezhad[3] and Mohaddeseh Mousavi[4]

Abstract

Nowadays, nanoparticles, including silver nanoparticles, can be synthesized in a green way with plant extracts, which are used in various fields such as dentistry, surgery, healing wounds and burns, bacteria control, and agriculture. In this research, we used three experimental setups that include two H-shaped tubes and a reactor that includes two beakers for the synthesis of nanoparticles. Synthesis was carried out under cold plasma and in interaction with liquid surface. The liquid contained 1mM silver nitrate and Osimum basilicum L. leaf extract. Argon gas plasma was applied to the liquid surface with different experimental setups and nanoparticles were obtained under a fast synthesis process by optimizing the plasma applying time and the amount of materials used in each setup. Characterization of nanoparticles which synthesized in each arrangement was done by scanning electron microscope and visible-ultraviolet spectroscopy. The results showed that optimum synthesized nanoparticles with a size below 100 nm and spherical and quasi-spherical morphology is related to the H-shaped tubes arrangement. The asymmetric H-shaped tube was prioritized due to its high synthesis efficiency.

Keywords: Osimum Basilicum, Cold Plasma, Green Synthesis, Silver Nanoparticles

1. Faculty of Physics, University of Tabriz, Tabriz
2. Faculty of Physics, University of Tabriz, Tabriz
3. Faculty of Physics, University of Tabriz, Tabriz
4. Faculty of Physics, University of Tabriz, Tabriz

Application of nanotechnology in the food industry- A review

Narjes kamali Sabeti[1], Alireza Hodhodi[2], Haniyeh Rostamzad[3]

Abstract

Food nanotechnology is a relatively recent area which has opened up a whole universe of new applications in food industry. Nanotechnology holds great promise to provide benefits not just within food products but also around food products. There is an urgent need for regulatory systems capable of managing any risks associated with nanofoods and the use of nanotechnology in food industry. The food market demands technologies, which are essential to keep market leadership in the food processing industry to produce fresh authentic, convenient and flavourful food products. Prolonging the product shelf life and freshness as well as improving the quality of food are the target. Recent innovations in nanotechnology have transformed a number of scientific and industrial areas including the food industry. Applications of nanotechnology have emerged with increasing need of nanoparticle uses in various fields of food science and food microbiology, including food processing, food packaging, functional food development, food safety, detection of foodborne pathogens, and shelf-life extension of food and/or food products. In this article, we have an overview of nanotechnology in the food industry and its applications.

Keywords: Nanofood, Food products, Nanotechnology, Food industry, Food safety

1. Department of Fisheries, Faculty of Natural Resources, University of Guilan, Sowmeh Sara, Guilan, Iran
2. Department of Fisheries, Faculty of Natural Resources, University of Guilan, Sowmeh Sara, Guilan, Iran
3. Department of Fisheries, Faculty of Natural Resources, University of Guilan, Sowmeh Sara, Guilan, Iran

Exosomes secreted by cardiosphere-derived cells induce differentiation of adipose mesenchymal stem cells into cardiomyocyte-like cells

Parisa Koohsarian[1], Mina Soufi Zomorrod[2*], Masoud Soleimani[3], Saeid Kaviani[4], Arezoo Karami Vandishi[5]

Abstract

Introduction: Exosome-based therapy has emerged as a novel approach to treat degenerative heart diseases that destroy cardiomyocytes. Exosomal research evidence suggests these extracellular nanovesicles play a role in repairing damaged cardiac tissue.

Purpose: This study aimed to investigate the effect of exosomes secreted by cardiosphere-derived cells (CDCs) on the differentiation of adipose-derived mesenchymal stem cells (AdMSCs) into cardiomyocytes in vitro.

Methods/Material: Exosomes were isolated from CDCs of Balb/c mouse embryos after separation by ultracentrifugation and characterized by Dynamic Light Scattering (DLS), Transmission Electron Microscopy (TEM) and Western Blotting. AdMSCs of adult mice in the third passage, were divided into three groups, i.e., untreated AdMSCs (control group), AdMSCs treated with CDC-derived exosomes (CDC-Exos group) and AdMSCs treated with a combination of 5-azacitidine, ascorbic acid and Transforming growth factorβ-1 (Aza+AA+TGFβ1 group) after flow cytometry. Treated AdMSCs were evaluated regarding morphology and expression of cardiac genes (including Pdgfrα, Gata4, Nkx2-5, Mef2c, Tnnt2, and

1. Department of Hematology and Cell Therapy, Faculty of Medical sciences, Tarbiat Modares University, Tehran, Iran
2. Department of Hematology and Cell Therapy, Faculty of Medical sciences, Tarbiat Modares University, Tehran, Iran
3. Department of Hematology and Cell Therapy, Faculty of Medical sciences, Tarbiat Modares University, Tehran, Iran
Department of Tissue Engineering and Applied Cell Science, School of Advanced Technologies in Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran
4. Department of Hematology and Cell Therapy, Faculty of Medical sciences, Tarbiat Modares University, Tehran, Iran
5. Department of Hematology and Cell Therapy, Faculty of Medical sciences, Tarbiat Modares University, Tehran, Iran

Myh7) by qRT-PCR on days 0, 3 and 7 after treatment.

Results: Morphological examination of AdMSCs showed transformation towards myotubes from the third day in both CDC-Exos and Aza+AA+TGFβ1 groups with an increased amount of myotubes on the seventh day compared to the control group. Moreover, qRT-PCR results in both CDC-Exos and Aza+AA+TGFβ1 groups revealed significant expression of cardiac genes on the seventh day after treatment compared to the control group ($P \leq 0.05$).

Discussion: The results of this study suggest that CDC-Exos could be considered as a novel regenerative tool for differentiation of AdMSCs into cardiomyocytes and repair of damaged myocardium.

Keywords: Cardiosphere-derived cell, Exosome, Differentiation, Adipose mesenchymal stem cell, Cardiomyocyte

Synthesis silver nanoparticles using *Peucedanum officinale* extract (PO@AgNPs) and investigation antibacterial and antioxidant activities

Mohammad Moein Mesbahzadeh[1], Pouria Mohammadparast-Tabas[2], Majid Zare-Bidaki[3], Sobhan Mortazavi-Derazkola[4]

Introduction and aims: Nowadays, the biosynthesis of metallic nanoparticles is on a sharp rise because of its potential in eliminating antibiotic-resistant bacteria. So that, this study reports an eco-friendly and cost-effective methodology for synthesizing biogenic silver nanoparticles (AgNPs) using alcoholic extract of *Peucedanum officinale* (PO@AgNP).

Material & Methods: In this research, we used *Peucedanum officinale* for the green synthesis of silver nanoparticles. In this study, various parameters such as concentration, time and temperature were investigated to achieve optimal conditions to synthesis PO@AgNP. All stages of reaction were monitored by UV-Vis spectroscopy. The PO@AgNPs were characterized in terms of structural properties and morphology with X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FT-IR) and transmission electron microscopy (TEM) techniques. The broth microdilution method was performed to determine the antibacterial activity of PO@AgNPs. The antioxidant activities of PO@AgNPs were examined as a percentage of DPPH inhibition.

Results: Examination of the XRD data confirmed the synthesis of crystalline particles. The FT-IR spectra showed that phenolic compounds in *Peucedanum officinale* extract act as a reducing agent of silver ions and formation PO@AgNPs. TEM images showed that PO@AgNPs had a spherical morphology with a size of about 30-40 nm. PO@AgNPs shown strong antibacterial activity against *Klebsiella pneumoniae* ,*Enterococcus faecalis* and *Streptococcus mitis* with minimum inhibitory concentrations (MIC) values were 31.2, 62.5 and 62.5 µg/ml, respectively. DPPH test have shown that with increasing

1. Student Research Committee, Birjand University of Medical Sciences, Birjand, Iran.
2. Student Research Committee, Birjand University of Medical Sciences, Birjand, Iran.
3. Infectious Diseases Research Center, Birjand University of Medical Sciences, Birjand, Iran.
4. Medical Toxicology and Drug Abuse Research Center (MTDRC), Birjand University of Medical Sciences, Birjand, Iran.

the concentration of PO@AgNPs (62.5 to 500 µg/ml), the percentage of radical inhibition of DPPH increased (25% to 55%).

Conclusion: All investigations showed that PO@AgNPs have high antibacterial activity against gram-positive and negative bacteria and have strong antioxidant properties and introduces it as a very efficient, eco-friendly and cost-effective nanoparticle.

Keywords: Silver nanoparticles, *Peucedanum officinale*, Antibacterial.

Borophene as a Two Dimensions Nanosheet

Naser alvani[1], Hamze Moayeri[2]

Abstract

During the last decades, many efforts have been accomplished in order to make single-layer materials are one of the subjects of amazing research. The existence possibility 2-D layers of boron atom. That has been strengthen after the discovery of graphene, made this element the center of attention. Borophene contains lots of amazing properties that these properties made this material the center of attention. Including that boron in a large amount is semiconductor, while Borophene shows the metallic properties. This material contains different Young's modulus than graphene.

Keywords: 2-D materials – Borophene – Dirac cones

1. Master Student, Jundi-Shapur University of Technology, Dezful, Iran
2. Faculty Member, Jundi-Shapur University of Technology, Dezful, Iran

Majorana Quasi-particles in Topological Superconductor

Maryam Sudani[1], Hamze Moayeri[2]

Abstract

Majorana presented a special form of Dirac equation which was the representation of the particle which they are the antiparticle of themselves as well. But these particles have not been discovered yet.

In superconductor, a mathematical structure has been discovered that they have the same structure as Majorana equation. However, the main difference of these quasi-particles is that unlike Fermions and Bosons, they obey the non-Abelian statistical mechanics. Majorana fermions are very interesting because they have been observed in edge of topological superconductor. These quasi-particles are used in topological quantum calculations.

Keywords: Dirac equation – Majorana quasi-particle – topological superconductor – non-Abelian statistical mechanics

1. Master Student, Jundi-Shapur University of Technology, Dezful, Iran
2. Faculty Member, Jundi-Shapur University of Technology, Dezful, Iran

Description of Graphene's Topological Defects through Gauge Fields

Mehrangiz Sakian Dezfuly Nezhad[1], Hamze Moayeri[2], Marzieh Khademarasul[3], Mohamad Davoud Taleb Zadeh[4]

Abstract

Carbon as one of the most important elements in the world that has played vital role in the formation of vital chains has been a human interest. Graphene is one of the carbon allotropes which with its unique behavior explains what quantum field theory suggests. It is a bridge between condensed matter physics and quantum electrodynamics. The special structure and the surface roughness's graphene and its quasiparticles that behaving as math less two-dimensional Dirac fermions due to the special quality of the graphene.

Keywords: Graphene – Dirac fermions – Topological defects – gauge fields

1. Master Student, Jundi-Shapur University of Technology, Dezful, Iran
2. Faculty Member, Jundi-Shapur University of Technology, Dezful, Iran
3. Faculty Member, Jundi-Shapur University of Technology, Dezful, Iran
4. Faculty Member, Jundi-Shapur University of Technology, Dezful, Iran

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Abstract

Carbon as one of the most important elements in the world that has played vital role in the formation of vital chains has been a human interest. Graphene is one of the carbon allotropes which with its unique behavior explains what quantum field theory suggests. It is a bridge between condensed matter physics and quantum electrodynamics. The special structure and the surface roughness's graphene and its quasiparticles that behaving as math less two-dimensional Dirac fermions due to the special quality of the graphene.

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1. Master Student, Jundi-Shapur University of Technology, Dezful, Iran
2. Faculty Member, Jundi-Shapur University of Technology, Dezful, Iran
3. Faculty Member, Jundi-Shapur University of Technology, Dezful, Iran
4. Faculty Member, Jundi-Shapur University of Technology, Dezful, Iran

Biosynthesis of Zinc Oxide Nanoparticles by Prunus scoparia leaf extract and Assessment of their Antioxidant and Catalytic Activity

Alireza Momeni[1], Mohammad Hadi Meshkatalsadat[2]

Abstract

In recent years, nanoscience has been widely applied in many fields, such as chemistry, physics, electricity, and agriculture. Nanoparticle preparation must be carried out using non-toxic, inexpensive, and safe chemicals in order to advance this science. Thus, following the principles of green chemistry, we synthesized high-value zinc oxide nanoparticles using almond (*Prunus scoparia*) leaf extract. UV-Vis and FT-IR spectroscopy as well as XRD and SEM were used to characterize the properties of the nanoparticles synthesized from the leaf extract. During the UV-Vis analysis, the synthesized nanoparticles were found to have their special peak at 398 nanometers. FT-IR spectroscopy as well showed a distinct peak of Zn-O stretching vibration positioned at 504.38 cm^{-1}. According to the XRD test, these nanoparticles synthesized from a biogenic source are hexagonal wurtzite with an average grain size of 71.3 nm. Using SEM analysis, the shape and size were found to be spherical and within the range of 67-103 nanometers. The biosynthesized ZnO nanoparticles degraded Methylene blue as organic dye in 20 minutes using $NaBH_4$ in a facile and uncomplicated reaction. In addition, antioxidant activity of these nanoparticles was studied through DPPH radical scavenging method, which proved that the synthesized nanoparticles are potent radical scavenger. Eventually, our findings in this study prove the reduction and stabilization properties of almond leaf extract and show that the obtained nanoparticles are a strong catalyst.

Keywords: Almond leaf; Antioxidant; Biosynthesis; Catalytic activity; ZnO nanoparticles

1. Department of Chemistry, Qom University of Technology, I.R Iran
2. Department of Chemistry, Qom University of Technology, I.R Iran

Temperature dependence of detectivity in Graphene/Si Schottky diode

Huda Musa Mutlaq[1*], Ali Jabbar Fraih[2]

Abstract

The discovery of two-dimensional (2D) materials such as graphene has attracted the interests of the scientific community in the recent years. Graphene is still one the most studied materials for its remarkable properties. The hybrid structures of graphene with semiconductor materials like silicon (G/Si heterostructures) have been studied extensively in the past years for applications such as photodiodes, photodetectors, and solar cells, with a growing focus on efficiency and performance. In this article, the graphene-silicon sample was first made and the current-voltage curve was measured at different temperatures and different intensities of 850 nm laser light. Then, the dependence of Noise equivalent power (NEP) and detectivity of graphene-Silicon sample in terms of temperature has been obtained. The results show that with increasing temperature, NEP increases and detectivity decreases.

Keyword: graphene, Silicon, Schottky diode, detectivity

1. College of Sience, Wasit University, Wasit, Iraq
2. College of Sience, Wasit University, Wasit, Iraq

Applications of nanotechnology in medicine – A review

Alireza Hodhodi[1], Narjes Kamali Sabeti[2], Haniyeh Rostamzad[3*]

Abstract

Nanotechnology is the exploitation of the unique properties of materials at the nanoscale. The size range of nanomaterials is between 1-100 nm, and in this scale, the physicochemical and biological properties of materials are fundamentally different from individual atoms and molecules. It is a multidisciplinary science whose goal is to control matter at the atomic and molecular level, and today its importance has become clear to all scientists. Nanotechnology has reached almost every sector and amazed the world by offering various potential applications in these sectors. This research is focused on the medical applications of nanotechnology. The results indicate the wide potential of this technology in drug delivery, gene transfer, medical imaging, and disease diagnosis, etc.

Keywords: Drug delivery, Gene transfer, Medical imaging, Nanomedicine, Nanotechnology.

1. Department of Fisheries, Faculty of Natural Resources, University of Guilan, Sowmeh Sara, Guilan, Iran
2. Department of Fisheries, Faculty of Natural Resources, University of Guilan, Sowmeh Sara, Guilan, Iran
3. Department of Fisheries, Faculty of Natural Resources, University of Guilan, Sowmeh Sara, Guilan, Iran

Colloidal Synthesis of Nanostructured Titanium Dioxide for Use in Photocatalytic Membranes

Vahideh Tajer Kajinebaf[1]

Abstract

Today, a large amount of industrial waste has been created; So that not treating them can cause environmental problems in addition to water wastage. For this purpose, in the current research, an attempt was made to synthesize a photocatalytic membrane based on titanium dioxide using the colloidal sol-gel method to investigate the possibility of its use in the wastewater treatment process. In this regard, titanium dioxide nanostructured membrane with simultaneous photocatalytic degradation and physical separation of methyl orange colored pollutant from wastewater was synthesized and its performance was investigated. Nanostructured titanium dioxide membrane was prepared by deposition of colloidal titanium dioxide sol on alumina substrates and its properties were investigated using dynamic light scattering (DLS), thermal analysis (TG-DTA), X-ray diffraction (XRD), field emission scanning electron microscopy (FESEM) and atomic force microscopy (AFM). The photocatalytic activity of titania membrane was investigated based on the rate of degradation of methyl orange in the presence of ultraviolet waves and the ability to separate methyl orange from aqueous solution was determined by measuring the changes in the concentration of the solution while passing through the membrane using a spectrometer (UV-vis). The efficiency of color removal from methyl orange solution based on photocatalytic degradation was calculated in the range of 80%, and its combination with the separation technique increased it to 95%.

Keywords: Titanium dioxide, Colloidal sol-gel, Photocatalytic membrane, Nanostructure

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1. Department of Materials Engineering, Takestan Branch, Islamic Azad University, Takestan, Iran

Theoretical study of optical properties of CuCl based on density functional theory

Hoda Dezfuli, Marzieh Khademalrasool*, and Parvin Behzadi

Abstract

In this paper, the optical properties of copper chloride, such as the real and imaginary parts of the dielectric function, Energy loss spectra, refractive index, extinction coefficient, and extinction coefficient in phase zinc-blende have been studied. Calculations have been done using the pseudo-potential method based on density functional theory with generalized gradient approximation (GGA) and local density approximation (LDA). The obtained results show that CuCl composition has maximum a reflection at low energies and then reflection decreases with the increase of energy.

Keywords: Optical properties, Copper chloride, Quantum espresso, Density Functional Theory

Study of structural and electronic properties of copper chloride: Density Functional Theory procedure

Hoda Dezfuli, Marzieh Khademalrasool*, and Parvin Behzadi

Abstract

In this article, structural parameters including lattice constant, optimal volume (V_0), bulk modulus (B), bulk modulus derivative (B'), and electronic properties such as energy band structure, density of electronic states, and density of electron cloud for the CuCl compound with the zinc-blende structure are calculated. The calculations have been done using the pseudo-potential method based on the density functional theory with two generalized gradient approximation (GGA) and local density approximation (LDA) based on PW_{scf} by the Quantum Espresso package. The results of the density of partial states showed that the conduction of this compound is due to the s and p orbitals of the copper atom, and the band structure also indicates the semiconducting property of this compound.

Keywords: CuCl composition, Energy band structure, Quantum espresso, Density Functional Theory.

Longitudinal conductivities in the magnetic topological insulation thin film with a thickness of 3 nanometers

Mir, Moslem[1]

Abstract

Consider a magnetic topological insulator thin film in the presence of magnetic impurities. Magnetic impurities are located in planes perpendicular to the surfaces of the thin film. In this system, we have two types of longitudinal electrical current. In the first type, the current is perpendicular to the plates, and in the second type, the current is parallel to the plates. We calculate the longitudinal conductivities of this system by using the Boltzmann approach and the generalized relaxation time method, It was shown that the value of both types of longitudinal conductivity depends on the direction of magnetic impurities. For a thin film with a thickness of 3 nanometers, with increasing the angle of the impurities, the longitudinal conductivity of the first type shows a maximum, while the longitudinal conductivity of the second type increases and becomes infinity at the angle of 90 degrees. Next, we investigated the effect of increasing the magnetization on the longitudinal conductivities. It was shown that with the increasing of magnetization, the longitudinal conductivity of the second type decreases for all magnetic impurities orientations, while the first type conductivity decreases in some orientations and increases in others orientations.

Keywords: Topological insulator thin film, longitudinal conductivity, magnetic impurities

1. Department of Physics, University of Zabol (UOZ), Zabol

Surface collective modes of two metallic nanoshell using hydrodynamic Drude model

Mir, Moslem[1]

Abstract

Consider two metallic nanoshells that are closely spaced. We use the hydrodynamic Drude model to investigate the collective modes of this system. We obtain four equations that give the surface collective modes of this system for arbitrary multipole excitations. We investigate the collective modes of this system for the dipole surface excitations. In this case, the system has four collective modes, two of which are in-phase and the other two are out of phase. In-phase collective modes have less energy than out-of-phase collective modes.

Keywords: Collective modes, metallic nanoshell,, non-local effects, surface plasmons.

1. Department of Physics, University of Zabol (UOZ), Zabol

Application of microfibrillated cellulose as a new material in nanocomposites

Alireza Yousefi[1*]

Abstract

Due to their abundance, high strength and stiffness, low weight and biodegradability, cellulose nanofibers (such as microfibrillated cellulose and bacterial cellulose) are known as promising candidates in the production of nanobiocomposites. Such new high-value materials are the subject of continuous research and have been used in the commercial production of new paper-based products and in the agricultural sector. The mechanical properties of pure microfibrillar (MFC) films prepared from nanofibrils with different cellulose molar masses have shown that despite relatively high porosity (up to 28%) for water-based MFC films, the Young's modulus (13.2 ± 0.6 GPa) and the tensile strength (214 ± 6.8 MPa) values were remarkably high. The results have shown that surface light scattering significantly reduces the light transmission of nanocellulose layers. When the film surfaces are polished or impregnated with an optically transparent polymer layer (e.g., using an acrylic resin), the total light transmission can be increased to 89.7%. The obtained results attribute high oxygen resistance characteristics to MFC films, so that the amount of oxygen transfer is reported as 17.75 ± 0.75 ml/m^2 per day for MFC films at a temperature of 23 °C and a relative humidity of 0%.

Keywords: Microfibrillated cellulose, Nanocellulose, Nanocomposite

1. Associate Professor, Faculty member at the Department of Chemical Engineering, University of Bonab, Bonab, Iran

Mechanical, UV absorbance and antibacterial properties of CMC-based nanocomposite films containing ZnO

Alireza Yousefi[1*], Younes Zahedi[2]

Abstract

In this research, nanocomposite films based on carboxymethyl cellulose (CMC) containing sodium montmorillonite (MMT) and zinc oxide nanoparticles (ZnO) were made by molding method. The results showed that the addition of nanoparticles decreases the water vapor permeability of the films by about 53%, while the humidity, density and glass transition temperature increase. Nanomaterials increased the resistance of nanocomposites against tensile stress in terms of elongation at break point. Nano zinc oxide was more effective in blocking UV light than nanoclay (99% vs. 60%), which was related to the loss of transparency of the film. The antibacterial test showed that gram-positive Staphylococcus aureus was more susceptible to zinc oxide nanoparticles than gram-negative Escherichia coli. As a result, it can be stated that the simultaneous integration of MMT and ZnO nanoparticles improves the performance characteristics of CMC film and increases its potential for food packaging applications.

Keywords: Nanocomposite films, Carboxymethyl cellulose, Zinc oxide nanoparticles

1. Associate Professor, Faculty member at the Department of Chemical Engineering, University of Bonab, Bonab, Iran
2. Associate Professor, Faculty member at the Department of Food Science and Technology, University of Mohaghegh Ardabili, Ardabil, Iran

Some physical, mechanical and thermal properties of cross-linked wheat starch-based nanocomposite films containing TiO_2

Alireza Yousefi[1*], Nazanin Yousefi[2]

Abstract

In this study, a new cross-linked wheat starch (CLWS)-based ternary nanocomposite incorporating sodium montmorillonite (Na-MMT) and titanium dioxide nanoparticles (TiO_2) was made using molding method. CLWS film showed better physical, mechanical and functional properties compared to native wheat starch (NWS) film. Incorporation of nanoparticles into the film leads to a decrease in water vapor permeability (WVP), water solubility (WS), moisture content (MC), whereas density increased. TiO_2 nanoparticles blocked UV light effectively, so that 99% of UV was removed by the film containing 4% TiO_2. Due to the addition of nanomaterials, the ultimate tensile strength (UTS) and Young's modulus (YM) values increased, while the elongation at break (EB) decreased. The results of thermal gravimetric analysis (TGA) showed that the addition of nanomaterials, especially TiO_2, improves the thermal stability of nanocomposite films.

Keywords: Nanocomposite, cross-linked wheat starch, Titanium dioxide nanoparticles

1. Associate Professor, Faculty member at the Department of Chemical Engineering, University of Bonab, Bonab, Iran
2. M.Sc. student, Department of Food Science and Technology, University of Mohaghegh Ardabili, Ardabil, Iran

Numerical analysis of an Active Terahertz Metamaterial with Ultra-Wide Bandwidth Absorption

Mahdi Rashki[1]

Abstract

In this article, we have numerically simulated a metamaterial absorber in the terahertz range based on vanadium dioxide (VO2), which is an element with adjustable properties active through changes in ambient temperature. The results show that full bandwidth absorption of more than 80% occurs with a frequency bandwidth of 6.92 THz under normal irradiation. VO2 absorption bandwidth is dynamically adjusted from 3% to 93% by changing VO2 conductivity from $\mathbf{2 \times 10^2}$ S/m to $\mathbf{2 \times 10^5}$ S/m. Wide bandwidth and flexibility in choosing an absorption frequency above 80% are the advantages of choosing this material. We have used the physical theory of impedance matching theory to confirm the results of this simulation. These results show that when the impedance of the environment is the same as the impedance of the structure, at that frequency point, we get the maximum absorption. The proposed absorber has applications in the terahertz region as a sensor, invisible coating, and electro-optical devices.

Keywords: Metamaterials, Terahertz, Perfect Absorber, Vanadium Dioxide.

1. Assistance Professor, Department of Physics, Faculty of Science, University of Zabol, Zabol

A Metallic Perfect Absorption metamaterial resonator in the IR by Silver Nano-Particle

Mahdi Rashki[1]

Abstract

In this article, we investigate the configuration of a sensor through optical metamaterial nano-absorbers. This structure consists of two F-shaped nanoparticles designed inverted and antisymmetric. Using the three-dimensional (3D) finite difference time domain (FDTD) method, we have numerically investigated the absorption and reflection spectrum, the effective refractive index, the effective electrical permeability, and the effective magnetic permeability coefficient in the infrared range. We have obtained sensitivity and coefficient of merit (FOM) for our model. Based on the simulation results, in the proposed sensor, the maximum sensitivity is 853 nm per refractive index (RI), while its FOM is 5.36 per refractive index unit.

1. Assistance Professor, Department of Physics, Faculty of Science, University of Zabol, Zabol

Silicon-Nitride Grating Sensor as a Biosensor for Bacteria Detection

Mahdi Rashki[1]

Abstract

In this article, we investigated a nanosensor based on the Si_3N_4 silicon-nitride grating. Nanosensors are designed from dielectrics, so has a low resonance width and a low-quality factor index. But the sensitivity concerning the change in refractive index is high. As the refractive index of the environment tiny changed the resonance peak on the wavelength shifted. Therefore, bio-nanophotonic sensors are usually based on the refractive index measurement phenomenon. A small change in refractive index, caused by an analyte or surface binding of biological species, induces a variation in the resonance wavelength of the nanostructures. In this article, we have used the presented structure to detect various types of bacteria with different refractive indices.

Keywords: Identifying Bacteria, Nano Biosensors, Silicon-Nitride based Sensor.

1. Assistance Professor, Department of Physics, Faculty of Science, University of Zabol, Zabol

The synthesis of muccoadhissive thiol-functionalized chitosan-alginate nanoparticle

Fatemeh Goudarsiasl[1], Ali Taravati[2]

Abstract

Nanoparticles are widely used in pharmaceutical research and industry, particularly as an effective drug delivery system. Chitosan and alginate are two accessible nano drug vehicles with some useful biological properties. So, the study aimed to synthesize thioled chitosan-alginate nanoparticles. According to the thiolation method, the nanoparticle was synthesized and then analyzed by FT-IR method. The results demonstrated that the highest peak of chitosan-alginate nanoparticles was at the 3438.56 cm^{-1} and 1250 and 1590 cm^{-1} bands belong to thiol functional group. These thioled nanoparticles can be used as drug vehicles in the drug delivery systems, because they are biocompatible, non-toxic, biodegradable, affordable and accessible.

Keywords: Nanomaterials, Nanoparticles, Thioled chitosan-alginate, Drug delivery

1. Department of Biochemistry, Faculty of Biological Science, University of Mazandaran, Babolsar, Iran
2. Department of Biochemistry, Faculty of Biological Science, University of Mazandaran, Babolsar, Iran

Plant Pathology Department, Faculty of Agriculture and Natural Science, Lorestan University, Khorramabad, Iran

Ehsan Hasanvand*, Samira Pakbaz

Abstract

With the frequent occurrence of extreme climate, global agriculture is confronted with unprecedented challenges, including increased food demand and a decline in crop production. Nanotechnology is a promising way to boost crop production, enhance crop tolerance and decrease the environmental pollution. In this review, we summarize the recent findings regarding innovative nanotechnology in crop production, which could help us respond to agricultural challenges. Nanotechnology, which involves the use of nanomaterials as carriers, has a number of diverse applications in plant growth and crop production, including in nanofertilizers, nanopesticides, nanosensors and nanobiotechnology. The unique structures of nanomaterials such as high specific surface area, centralized distribution size and excellent biocompatibility facilitate the efficacy and stability of agrochemicals. Besides, using appropriate nanomaterials in plant growth stages or stress conditions effectively promote plant growth and increase tolerance to stresses. Moreover, emerging nanotools and nanobiotechnology provide a new platform to monitor and modify crops at the molecular level.

Keywords: plants, nanobiotechnology, nanopesticides, nanosensors, nanotechnology.

Application of nanoparticles as antiviral agents and inducing resistance against plant pathogens in transgenic plants

Ehsan Hasanvand[1]*, Samira Pakbaz[2]

Abstract

Current efforts are focused on the search for efficient methods of pathogen management that will not result in damage to the environment or cause an imbalance in the existing biota. One of the strategies for this is the use of nanoparticles in agriculture for disease management. This review presents a summative view on the various applications of nanoparticles in conferring disease resistance to crops and the possibility of using nanoparticles as carriers of genetic material for the generation of disease resistant crops. Nanoparticles have been used as antiviral, antifungal and antibacterial agents. It will be desirable to use nanoparticles to identify possible treatments for various viral diseases or to identify resistant genes in the plant's cellular and biological system to improve resistance to viruses in infections. Inhibition of plant viruses using nanoparticles can solve problems caused by virus. Nanoencapsulated agrochemicals or biomolecules can be engineered to be released in a controlled manner and in a target-specific location. Nanoparticles have also been used in the field of transgenic and as a means to transfer siRNA in plant cells. Plant genetic modification by nanoparticles has the potential to improve plants by increasing disease resistance. In the near future, the field of agriculture can be transformed by using nanoparticles and by inducing resistance to diseases in products.

Keywords: disease management, gene silencing, nano-encapsulation, plant protection.

1. Plant Pathology Department, Faculty of Agriculture and Natural Science, Lorestan University, Khorramabad, Iran
2. Plant Pathology Department, Faculty of Agriculture and Natural Science, Lorestan University, Khorramabad, Iran
* Corresponding author: Ehsan Hasanvand

Role of different concentrations of zinc nanoparticles on the motility and viability of ram sperm during cold storage conditions

Fatemeh Omidi[1], Hadi Hajarian[2*], Leila Soltani[3], Hamed Karamishabankareh[4]

Abstract

Objective: The objective of this study was to examine the effects of adding different concentrations of Zinc nanoparticles(ZnO-NPs) on ram sperm motility and viability during liquid storage at 5°C.

Materials and Methods: ZnO-NPs were synthesized with the aid of zinc nitrate and barberry extract. For identification, SEM, FT-IR, and UV-VIS spectrometer were used. Semen samples were collected from 4 fertile rams. Semen samples were pooled and diluted in the tris-base extender. After adding ZnO-NPs (0, 1, 10, and 100µg/mL) to the extender, they were kept at 5°C for 4h. At the end of the incubation period, the motility and viability rates were determined. The viability of the cells was evaluated by staining with eosin-nigrosin and examining motility under an inverted microscope. The data were analyzed using SPSS software and Duncan's multi-range test was used to compare the results. In this study, 5% significance was considered.

Results: The synthesis of nanoparticles was confirmed using SEM, FT-IR, and UV-Vis spectrophotometer. In all concentrations of ZnO-NPs, the viability and mobility percentages were increased compared with the control group ($p<0.05$).

Conclusion: According to the data, ram sperm quality appears to be improved by ZnO-NPs during cold storage at 5°C.

Key words: ZnO-NPs, Liqiud storage, semen.

1. MSc Student, Razi University
2. Assistant Professor, Razi University
3. Assistant Professor, Razi University
4. Full Professor, Razi University

Synthesis of Alginate / PVA coated magnetic iron oxide nanoparticle.

Zeinab Ghanbari[1], Ali Taravati *[2]

Abstract

A number of nanoparticles have been developed and evaluated over the past few years. They have been found to have favorable properties in biology and medicine, making them effective carriers for the delivery of drugs and the stabilization of enzymes. The purpose of this study is to synthesize magnetic iron nanoparticles coated with alginate/PVA. Alginate has been investigated due to its biocompatibility, low toxicity, and relatively low cost. Further, the challenges associated with synthesized materials are discussed in terms of conclusions and future prospects.

In this study, co-precipitation method was used in this study to synthesize alginate magnetic nanoparticles using FeCl2, FeCl3, and polyvinyl alcohol (PVA). Epichlorohydrin was used as a linker to connect alginate/PVA on the surface of magnetic nanoparticles during the synthesis process. As a final step, the reaction mixture was kept at 60 degrees Celsius for one hour, followed by washing and separation. Then, FTIR was used to investigate the formation of synthesized nanoparticles and the presence of functional groups related to these polymers and iron. Synthesized nanoparticles possess good magnetic properties, so an external magnet was able to separate them from the solution. As demonstrated by FTIR analysis, this nanoparticle was well formed with a coating consisting of alginate and PVA.

Due to these findings, synthesizing magnetic iron nanoparticles coated with alginate/PVA in order to stabilize the enzyme will result in its stability and its reuse.

Keywords: Alginate, Epichlorohydrin, Polyvinyl alcohol, Magnetic nanoparticles

1. Department of Molecular and Cell Biology, Faculty of Basic Sciences, University of Mazandaran, Babolsar, Iran
2. Department of Molecular and Cell Biology, Faculty of Basic Sciences, University of Mazandaran, Babolsar, Iran

Preparation and characterization of Fe_3O_4 magnetic nanoparticle coated with chitosan-PVA

Amir Gholipour[1], Ali Taravati [*2]

Abstract

The use of nanomaterials as a carrier for enzyme immobilization has received attention in recent years, because of their large available surface; It offers higher enzyme-loading capacity, decreased mass transfer resistance, and increased mechanical resistance. The use of Magnetic Nanoparticles (MNPs) for immobilization is extensively studied. Chitosan is used as a surface coating agent for the synthesis of nanoparticles. Among its features are its non-toxicity, biodegradability, and biocompatibility, which has led to its extensive use in the food, cosmetic, pharmaceutical, and biotechnological industries.

A magnetic nanoparticle coated with chitosan-PVA was synthesized in the first step by co-precipitation. For this purpose, polyvinyl alcohol (PVA) and chitosan were added to an acetate buffer with a pH of 5.4. In the next step, FeCl2, FeCl3, and then sodium hydroxide (NaOH) were used to create a magnetic state in nanoparticles. After that, the cross-linker epichlorohydrin (ECH) was added to the compounds in order to link chitosan to PVA on the nanoparticle surface. As the next step, it was placed in a 60°C for one hour and then washed and separated with a magnet.

In spite of the polymer coatings formed on the surface of the magnetic iron nanoparticle, the particles showed good magnetic strength. By using an external magnet, it was well separated from the solution. Based on the results of the FTIR analysis, chitosan-PVA nanoparticles were found to be formed well. As a result, chitosan-PVA nanoparticles can be used for enzyme stabilization and drug delivery.

Keywords: Epichlorohydrin, Polyvinyl alcohol, Chitosan, Magnetic Iron Nanoparticle

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1. Department of Molecular and Cell Biology, Faculty of Basic Sciences, University of Mazandaran, Babolsar, Iran
2. Department of Molecular and Cell Biology, Faculty of Basic Sciences, University of Mazandaran, Babolsar, Iran

Investigating the effect of nano silica and aluminum hydroxide on thermal properties and morphology of nanostructures obtained from waste polyethylene and OCC pulp

Ahmad Samariha[1]

Abstract

The main purpose of this research is to investigate the effect of nano silica and aluminum hydroxide on thermal properties and morphology of nanostructures obtained from waste polyethylene and OCC pulp. For this purpose, waste polyethylene and OCC pulp (at a fixed level of 50% by weight), nano silica (at three levels of 0, 5 and 10% by weight), aluminum hydroxide at a fixed level of 5% and maleic anhydride grafted with ethylene at a fixed level. 3% were mixed by double screw extruder and standard test samples were made using manual press method. Then the thermal properties were measured. Also, in order to investigate the structure and function of nano-silica particles, the morphology of the resulting nano-multistructure was investigated by X-ray diffraction (XRD) test. With the increase of nano silica up to 10%, the thermal stability increases and more coal remains. By increasing the percentage of nano-silica from 0 to 10%, the intensity of crystallinity decreased.

Keywords: nano silica, thermal properties, X-ray diffraction (XRD),

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1. Assistant prof., Department of Wood Industry, Technical and Vocational University (TVU), Tehran, Iran

Nanographene's Influence on Physical properties, and multi-structured residual ash of a Recycled High Density Polyethylene/Poplar Wood Flour Nanocomposite

Ahmad Samariha[1*], Jafar Ghaje Beigloo[2]

Abstract

In this study, the effect of the amount of nanographene on physical propertices of wood-plastic composites was reviewed. Using the recycled polyethylene (high density polyethylene), nanographene and poplar wood-flour, the Wood-Plastic was made. The amount of 80% of polymer matrix and 20% of poplar wood flour and the amount of nanographene at four weight levels of 0.5, and 1.5 percent were used. For making the samples, an internal mixture was utilized. The results showed that with the increase of the rate of nanographene by 1.5 weight percent, water absorption and the thickness swelling of the composite decreases. With the increase of the rate of nanographene, the rate of residue ash increased as well.

Keywords: Recycled High Density Polyethylene; Nanographene; Wood-Plastic Composite

1. Assistant prof., Department of Wood Industry, Technical and Vocational University (TVU), Tehran, Iran
2. Department of Wood and Paper Science Technology, College of Agriculture and Natural Resources, Science and Research Branch, Islamic Azad University, Tehran, Iran

Electrospun nanofibers: Applications in food safety

Sedighe Moghbeli Damaneh*[1], Fatemeh Heidari Dalfard[2], Adeleh Mohammadi

Abstract

Food safety is a bottleneck problem. Food packaging is a interdisciplinary area including food science, food engineering, food chemistry, and food microbiology, and the concern in preserving the freshness and quality of foods has grown extremely. For this target, electrospinning technology has gained much attention due to its unique functions and superior processing. Electrospinning involves an electrohydrodynamic process, during which a liquid droplet is electrified and followed by stretching and elongation to generate fiber. The nano and microfibers have been developed using many food waste materials and food-grade raw materials. Furthermore, these waste materials are rich in bioactive compounds, such as the peels and seeds of fruits and vegetables. In recent research, use of the food grade material for electrospinning to make packaging films has been preferred.

Keywords: Electrospinning, fibers, Food safety, Food Packaging

1. Faculty of Food Science and Technology, Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, Iran
2. Faculty of Food Science and Technology, Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, Iran

Pickering emulsion, environmental friendliness

Fatemeh Heidari Dalfard*[1], Sedigheh Moghbeli Damaneh[2], Adeleh Mohammadi[3]

Abstract

Pickering emulsion is a kind of stable emulsion formed by the hydrophilic and hydrophobic solid particles that are irreversibly adsorbed onto the oil–water interfacial film. Attention to pickering emulsions have been increasing in recent years because of their enhanced stability and environmental friendliness compared with conventional emulsions. Compared with tradition emulsions using surfactants, it has obvious advantages, such as desirable rheological properties, digestibility and freeze-thaw stability reduced harmful effects of emulsifiers on humans, reduced production costs, environmental friendliness,etc., which endows them more possibilities in food applications. Pickering emulsions can encapsulate active ingredients and serve to improve digestive absorption and bioavailability. Future studies should focus on improving the stability of Pickering emulsions in food production process and developing commercial values of Pickering emulsions in food field. Although application prospect is very broad, there are still many challenges. Because the environment of the actual food production process is more complicated and changeable, it is very difficult to maintain the stability of Pickering emulsions. Also, most of the experiments are limited in the laboratory and it has not been commercially developed on the industrial scale.

Keywords: Pickering emulsion, Environmental friendliness, Food safety, Food-grade particles.

1. Faculty of Food Science and Technology, Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, Iran
2. Faculty of Food Science and Technology, Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, Iran
3. Faculty of Food Science and Technology, Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, Iran

The effect of foliar application of ZnO NPs on the photosynthetic pigments of Camelina under salinity conditions

Torfeh Akhavan Hezaveh[1]

Abstract

The present experiment was conducted with the aim of investigating the effect of zinc oxide nanoparticles on some physiological characteristics of Camelina Sativa L. in a factorial manner in the form of a completely randomized design with three replications in greenhouse conditions. The investigated treatments included salinity at 0, 75 and 150 ml and foliar spraying of zinc oxide nanoparticles at three concentrations of zero, 30 and 60 mg/l. Salinity decreased the relative content of water and chlorophyll a and increased ion leakage in Camelina plant. The plants foliar sprayed with 60 mg/liter nano oxide had the highest ion leakage, the highest relative water content was obtained in foliar application with zinc oxide nanoparticles, although the increase was not significant. Zinc nanooxide did not show any effect on carotenoid and chlorophyll b. ZnO NPs application with 30 mg/liter improved content of K and decreased content of Na in Camelina plants.

Keywords: Camelina, carotenoid, chlorophyll, EC, Nano ZnO,RWC

1. Department of Biological Science. Technical and Vocational University (TVU), Tehran. Iran

Evaluation and investigation of the use of nanoparticles in the production of biofuels

Mohammad Haji Savameri[1], Sahar Abdolahi[2]

Abstract

In the past few decades, global warming has been one of the most important human environmental problems. One of the main reasons for global warming is the production of CO_2 gas as a result of burning fossil fuels. The proposed solution is to replace fossil fuels with green fuels such as bioethanol, biohydrogen, etc. In the meantime, the rapid progress and development of nanotechnologies provide practical tools to use this attractive technology in various fields, including biofuel production. The use of different types of nanoparticles, especially metal nanoparticles, to produce different types of biofuels such as biohydrogen, biodiesel, bioethanol, and biogas can greatly help to improve production efficiency and performance. This research expresses the most important developments in the last decade regarding using various nanomaterials and nanoparticles to increase the efficiency of biofuel production such as biogas, biodiesel, and biohydrogen.

Keywords: biogas, biohydrogen, biodiesel, biofuel, nanoparticles.

1. Department of Petroleum Engineering, School of Chemical and Petroleum Engineering, University of Shiraz, Shiraz, Iran
2. Department of Chemistry, Faculty of Science, University of Ilam, Ilam, Iran

Characterization of nano zirconia contaminated with metal elements of lanthanide group using positron lifetime annihilation spectroscopy

Mahdi Ghasemifard, Misagh Ghamari

Abstract

In this article, the crystalline structure and defects of pure and contaminated nano zirconium dioxide (ZrO2), which was synthesized by co-precipitation method, have been studied. Defects, porosity and lattice structure of pure and contaminated nano (ZrO2) were investigated with the help of positron annihilation lifetime spectrometer (PALS). The results of PALS analysis show that the metal ions Pr^{3+}, Sm^{3+}, Dy^{3+}, and Er^{3+} occupy the interstitial positions and the metal ion Eu^{2+} substitutes the vacancy of the zirconium atom. Creating an energy level by metal ions plays the role of positron trapping centers that prevent electron-hole recombination and thus affect the electrical conductivity of zirconia.

Study of Sonocatalytic and Photocatalytic performance of CeO_2 nanoparticles synthesized via co-precipitation method

Gholamhossein Khorrami[1], M. Mahla Mirzaie Kakhki[2], Ahmad Kompany[3]

Abstract

In this research, cerium oxide nanoparticles were successfully synthesized by co-precipitation method. Cerium nitrate was used as the starting materials and deionized water as the solvent. The structural properties and morphology of the prepared samples were investigated using X-ray diffraction(XRD) and transmission electron microscopy (TEM) technique. The XRD patterns showed that the sample had cubic structures without any unwanted phases. The average crystallized size, dislocation density, lattice strain, and specific surface area were calculated using X-ray diffraction pattern. The TEM image showed that the average size of nanoparticles is about 15 to 20 nm. The band gap of nanoparticles is estimated about 3.91 eV. Methylene blue was used to investigate the sonocatalytic and photocatalytic activity of the synthesized sample. Our results indicated that the sonocatalytic performance of the cerium oxide nanoparticles is better than photocatalytic performance of it.

Keywords: cerium oxide, sonocatalyst, photocatalyst, nanoparticle

1. Physics group, Faculty of basic science, University of Bojnord, Bojnord, North Khorasan
2. Materials and electroceramics lab., Physics group, Faculty of science, Ferdowsi university, Mashhad.
3. Materials and electroceramics lab., Physics group, Faculty of science, Ferdowsi university, Mashhad.

Study of Structural and Optical properties of pure and Cr-doped PZT nanoparticles synthesized sol-combustion route

Gholamhossein Khorrami[1], Maliheh Mousavi[2]

Abstract

In this research, pure and Cr-doped lead zirconate titanate nanoparticles were successfully synthesized by gel-combustion route. The structural properties of the prepared nanoparticles were investigated using X-ray diffraction (XRD) and fourier transform infrared spectroscopy (FTIR). The XRD patterns showed that the samples had tetragonal structure. The average crystallized size, dislocation density, lattice strain, and specific surface area were calculated using X-ray diffraction pattern. Transmission electron microscopy (TEM) technique was used to study of morphological properties and calculate of average size and distribution of nanoparticles. The TEM image showed that the average size of nanoparticles is about 20 to 30 nm. The band gap of nanoparticles are estimated using diffuse reflection spectroscopy and according Kubelka-Munk model.

Keywords: gel-combustion, lead zirconate titanate, nanoparticle

1. Physics group, Faculty of basic science, University of Bojnord, Bojnord, North Khorasan
2. Physics group, Faculty of basic science, University of Bojnord, Bojnord, North Khorasan

An overview of nanotechnology and the necessity and principles of teaching it in schools

Amir mohammad Bahrami maddah[1*], Zohre Serkan[2], Jafar Azamat [3]

Abstract

Nanotechnology is not a new field; Rather, it is an interdisciplinary topic that is closely related to physics, chemistry, medicine, energy, etc. The emergence of nanotechnology, in addition to the revolution it created in the world, created a commotion in the education systems of countries around the world to train experts in this field. The expansion of the use of nanotechnology in various branches of industry, medicine, electronics, agriculture and health, prompts educational systems to raise the awareness of students in this field by providing concepts and topics related to nanomaterials and their applications. increase science Various educational programs for different age groups show the comprehensive attention to investment in this branch of technology. Therefore, it is necessary to update the science offered in schools and include science and nanotechnology in a coherent way so that future generations and the workforce can make responsible scientific decisions. Among the advantages of nanosciences with other sciences is to enable students to better understand and communicate between sciences. In this article, nanotechnology and the necessity and principles of its education in schools are emphasized. The study method is searching in Persian and English databases and reviewing articles, books and theses related to nanotechnology and its education. At the end, the results of nanotechnology education in schools are stated.

Keywords: nanotechnology, educational principles, nanotechnology education.

1. Master student of chemistry, Farhangian University, Tabriz, Iran
2. Expert in supervision of preschool centers, General Directorate of Education, Hamadan, Iran
3. Department of Basic Sciences, Farhangian University, Tabriz, Iran

The effect of dilution solvent on the light emitting properties of carbon quantum dots.

Maedeh Masoumi[1], Arman Ghasedi[2], Mohammad Zirak[3], Hassan Alehdaghi[4]

Abstract
In this paper, carbon quantum dots (CQDs) were synthesized via solvothermal method; by using 1-5 diaminonaphthalene, citric acid dissolved in ethanol. After purification via centrifugation and filtration processes, the obtained CQDs solutions were diluted by two different solvents namely ethanol and aqueous NaOH solution, named as “E” and “Na” samples. The photoluminescence (PL) spectra of these two different solutions revealed that E sample exhibited a long wavelength photo emission of λ = 580 nm, while Na sample showed a obvious blue shift with PL emission of λ = 286 nm. In addition, dilution with NaOH reduced PL emission intensity significantly, while ethanol dilution has almost no negative effect on PL intensity. Changing the PL properties of CQDs by such a simple technique can be very interesting for many applications.

Keywords: solvothermal, Carbon quantum dots, Light emitting, Photoluminescence,

1. Physics Department, Faculty of science, Hakim Sabzevari University, Sabzevar, Iran
2. Physics Department, Faculty of science, Hakim Sabzevari University, Sabzevar, Iran
3. Physics Department, Faculty of science, Hakim Sabzevari University, Sabzevar, Iran
4. Physics Department, Faculty of science, Hakim Sabzevari University, Sabzevar, Iran

Investigating the effect of foliar application of iron, zinc and copper nanoparticles at different levels of nitrogen fertilizer on safflower

Mohsen Janmohammadi*, Naser Sabbaghnia[1]

Abstract

Nanotechnology applications in agriculture appear to be a promising approach, fostering the transformation of conventional production systems into upgraded agricultural practices with a clear emphasis on the development of more efficient and environmentally friendly methodologies. Nanofertilizers could be a crucial development in the protection of the environment because they can be applied in smaller quantities compared to traditional fertilizers. In order to evaluate the effects of different levels of nitrogen fertilizer (0, 75 and 150 kg/ha) and nanostructured micronutrients (zinc, iron, copper) on spring safflower seed yield, a study was conducted in Baneh region. The special objectives were to evaluate the effects of the combined application of nanochelate micronutrients and nitrogen on safflower in rainfed conditions. The evaluation of morphological traits showed that the application of nitrogen at the rate of 75 kg per hectare caused a significant increase in plant height, canopy spread, stem diameter and plant dry weight. Also, ground cover, canopy spread, head diameter and the number of secondary branches were significantly affected by micronutrients, so the highest values were observed in plants grown with zinc and copper. The overall results showed that the application of zinc nanoparticles at low levels of nitrogen and the application of copper in conditions of high nitrogen fertilization have the best effects. The use of micronutrients and nitrogen through synergy resulted in better effects of both fertilizers.

Key words: performance components, interaction, plant growth, iron nanoparticles, zinc nanoparticles, synergism,

1. Department of Plant Production and Genetics, Faculty of Agriculture, University of Maragheh

Evaluation of the effectiveness and impacts of different nano-structured micronutrient fertilizers on chickpea growth

Mohsen Janmohammadi*, Naser Sabbaghnia[1]

Abstract

Nano-fertilizers (NFs) significantly improve soil quality and plant growth performance and enhance crop production with quality fruits/grains. The management of macro-micronutrients is a big task globally, as it relies predominantly on synthetic chemical fertilizers which may not be environmentally friendly for human beings and may be expensive for farmers. NFs may enhance nutrient uptake and plant production by regulating the availability of fertilizers in the rhizosphere; extend stress resistance by improving nutritional capacity; and increase plant defense mechanisms. They may also substitute for synthetic fertilizers for sustainable agriculture, being found more suitable for stimulation of plant development. The purpose of this study was to investigate the effect of common fertilizers and different nano-fertilizers on the growth and yield of chickpeas. This experiment was conducted in Maragheh region and the experimental treatments included T1: control (without fertilizer), T2: nanochelate iron, T3: nanochelate manganese, T4: nanochelate copper, T5: nanochelate boron, T6: organic manganese, T7: normal NPK fertilizer. , T8: multi-nutrient nanofertilizer and T9: zinc nanochelate. The results showed that the application of multinutrient nanofertilizer, conventional NPK fertilizer and zinc nanochelate significantly improved vegetative growth (eg plant height, crown width, number of branches) and yield components. Also, the highest chlorophyll concentration was recorded for the plant grown using multi-nutrient/combined fertilizers. The results showed that the best yield of chickpeas can be obtained through the use of multi-nutrient nanofertilizers, with the simultaneous release of micronutrients and macronutrients.

Key words: performance components, interaction, plant growth, iron nanoparticles, zinc nanoparticles, synergism,

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1. Department of Plant Production and Genetics, Faculty of Agriculture, University of Maragheh

Investigating the effect of foliar spraying of silicon and titanium nanoparticles on the growth characteristics of safflower

Mohsen Janmohammadi*, Naser Sabbaghnia[1]

Abstract

In the agricultural sector, the use of useful nanoparticles (NPs) has become the focus of plant researchers' attention in recent years. Nanotechnology has gained a prominent position among these technological innovations due to its wide range of applications in preserving the agricultural ecosystem. Several studies have been conducted on the effect of NPs on the growth and development of food crops. One of the parts that is probably less discussed is the role of nanoparticles in regulating the growth of the beneficial and forgotten plant of saffron. In the meantime, some useful nanoparticles such as silicon and titanium are receiving more attention due to their excellent biocompatibility, high rate of penetration and absorption of nanoparticles in plants. A field experiment was conducted to investigate and compare the foliar application of two nanoparticles and the effect of silicon dioxide nanoparticles (SiO2 NPs- 10 and 20 mM) and titanium dioxide nanoparticles (TiO2 NPs- 25 and 50 mM) on growth components and physiological characteristics. The oilseed plant was evaluated. Comparison of foliar treatments showed that both nanoparticles (silicon and titanium) improved plant growth and performance compared to conditions without foliar application. However, the effect of nanosilicon was more evident than that of titanium. The highest amount of seed oil was recorded in favorable irrigation conditions (irrigation after evaporation of 60 mm) with nano-titanium foliar spraying. The percentage of palmitic acid, arachidic acid and myristic acid in the seed increased with the application of nano titanium. Overall, principal component analysis showed that 10 mM nano silicon dioxide spray was the best foliar treatment under all moisture regimes.

Key words: palmitic acid, shoot growth, grain yield, oil quality, nano titanium oxide, nano

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1. Department of Plant Production and Genetics, Faculty of Agriculture, University of Maragheh

A comparative study of 1-bit Full Adders at 16nm FinFET technology

Masume Khaligh, Farzad zandian

Abstract

Full Adders are a fundamental component of digital signal processing (DSP) circuits and form the basis of all digital computing circuits, accounting for a significant portion of chip speeds. As semiconductor manufacturing technology advances, there is a growing demand for high-speed and low-power full adders due to the increasing complexity of systems, reduction of voltage levels, and scaling of technology. FinFET technology has become a preferred choice in the microelectronics industry because of its scalability, superior performance, high speed, and ability to control nano-scale gates. In this article, we present simulation results for 1-bit full adders in HSPICE using the PTM model for both 16-nm MOSFET and FinFET technologies at 25°C and a supply voltage of 0.8V. We compare the performance of 1-bit full adders in 16-nm FinFET technology and show that FinFET full adders outperform MOSFET full adders in terms of propagation delay, power-delay-product (PDP), and energy-delay-product (EDP). Our findings demonstrate the superior performance of FinFET technology over MOSFET in the design of high-speed and low-power full adders.

Evaluation of physicochemical and antimicrobial properties of liposomal nanocarriers containing garlic essential oil (*Allium sativum*)

Salar Ali Ahmed[1], Mahmood Fadhil Saleem [2], Hamed Hassanzadeh[3*]

Abstract

Introduction: The use of nano-carrier systems like liposomes may stabilize different bioactive compounds against environmental and chemical changes as well as increase their bioavailability and stability, improving its shelf-life. **Purpose:** The sensitive character and especially the strong odor of garlic compounds, restricts its application in food products and only a few technological approaches have been reported to overcome this limitation. This work is aimed to conclude that liposomes constitute a suitable system for encapsulation and controlled release of garlic active compounds with inhibitory effect against bacteria. **Material and Methods:** lecithin and lipid composition(garlic essential oil), were solved in chloroform/ethanol (2: 1, v/v) inside the 500 ml round-bottom fl ask then by using rotary evaporator in constant temperature above the lipid phase transition temperature (Tc), under negative pressure and high vacuum for 2hour organic solvent was removed and a thin layer was formed in bottom flask. Free radical scavenging activity of GEO nanophytosomes and free GEO were determined using DPPH method by calculating IC50 DPPH. Also, Minimum inhibitory concentration (MIC) of GEO nanophytosomes was determined using microbroth dilution method in 96-well plate. **Results and Discussion:** The results of antioxidant and antimicrobial capacity tests of produced nanoliposomes containing garlic essential oil showed that only samples with high concentration of essential oil showed significant antioxidant and antimicrobial properties.

1. Department of Food Technology, Faculty of agricultural engineering science, Salahaddin University-Erbil, Erbil, Iraq
2. Department of Food Technology, Faculty of agricultural engineering science, Salahaddin University-Erbil, Erbil, Iraq
3. Department of Food Science and Hygiene, Faculty of Para-Veterinary, Ilam University, Ilam, Iran

Investigation of hydrophilic properties of flourine doped tin oxide coated by ultrasonic mist vapor deposition method

Behnoosh Abvarz، Hassan Alehdaghi، Mohammad Zirak، Hossein Asghar Rahnamay Aliabad

Abstract

In this article, thin films of SnO2 and FTO (SnO2:F) are cotaed by ultrasonic mist vapor deposition (UMVD) .Thin films of SnO2 have attracted a lot of attention due to their high stability and economic efficiency. UMVD is a simple method for thin film coating, which is formed by precise control of the parameters and optimization of the various properties for layers. For this purpose in this work the thin films of SnO2 at different temperatures and FTO films with the diffrent molar ratio weight Sn:F were prepared by UMVD method and their hydrophilicity and hydrophobicity were investigated.

The effect of chitosan on smart hydrogels in drug delivery for cancer treatment

Zahra Ansari[1], Amir Keshavarz[2]

Abstract

Today, cancer is a global health problem and has become one of the leading causes of death. There have been various treatment options for cancer patients according to the diagnosis and different stages of the tumor, including surgery, chemotherapy, etc., but these treatments had many side effects such as limited effectiveness and damage to normal organs. Therefore, the design and construction of new efficient and less toxic drug delivery systems for cancer treatment has attracted much attention. Local administration of anticancer drugs with the need of lower drug dose and less toxicity to non-targeted tissues has been considered. In the meantime, hydrogels with 3D network can absorb and retain a large amount of water and can carry one or more drugs in 3D mesh to enclose each other. In addition, hydrogels can maintain a moist environment at the site of application and prolong drug release and prevent it from spreading to other healthy areas. Also, chitosan is a natural polymer and due to its good biocompatibility, low toxicity, and biodegradability. It is used as a material for biomedical applications. In this research, while studying different types of hydrogels, it was observed that chitosan-based hydrogels can play a prominent role as a strategy in targeted drug delivery.

Keywords: injection, drug delivery, cancer, chitosan, hydrogel

1. Master's Degree in Polymer-Processing Engineering, Arak University
2. Bachelor of Polymer Engineering, Bouin Zahra Engineering Higher Technical Education Center

Investigation of Nanomaterials in Sustainable Architecture (Case Study: Reducing Energy Consumption in Architecture)

Peyman Naghipour[1]* , Shahab Adam Navasi [2]

Abstract

Green architecture or sustainable architecture is one of the new trends and approaches of architecture that has attracted the attention of many contemporary designers and architects in recent years. The research method in this research is based on the practical purpose and its purpose is to obtain the consensus of experts familiar with the subject of the study. This research seeks to deconstruct conventional structures with green architecture topics such as reducing electricity consumption and using technologies to achieve the goals of green architecture by entering the topic of nano materials and its practical application in green architecture. In addition to focusing on nanomaterials in green architecture, this research aims to show how the practical applications of technology in green architecture have profound effects on the country's macro-economy and the economic status of the family by conducting calculations and statistical tests. . A summary of some nanomaterials used in green architecture is presented after the theoretical foundations. In this research, the Pearson correlation coefficient was used to test the statistical hypotheses, and the progressive partial least squares (PLS) method was used to evaluate the sub-hypotheses, and finally, the Friedman test was used to rank the variables of the sub-hypotheses. In this research, the regression method is used to show the equation of energy consumption (electricity) and finally, suggestions for electricity production and consumption planning at the macro level of the country as well as in the field of reducing energy loss in residential and industrial structures in the case of green architecture using Nanomaterials are presented.

Key words: Reducing Energy Consumption, Architecture, Green Architecture, Nano Materials, Nano Technology.

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1. Bachelor's Degree Student, Architectural Professional Engineering and Islamic Azad University, Tabriz Branch, Iran
2. PhD Student in Urban Planning, Islamic Azad University, Central Tehran Branch, Tehran, Iran

Investigation of Nano Technology in Architecture and Urban Planning and its Role in Building Materials

Peyman Naghipour [1]* , Shahab Adam Navasi [2]

Abstract

Nowadays, various technologies are used in order to create more comfort and security and to save costs, especially in the consumption of energy resources. Nanotechnology is one of the new technologies for which a very bright future is predicted, and the extent of the impact of this technology is so great that it is said that this technology can affect most aspects of human life in the future, and for this reason, the use of an appropriate way of dealing with this phenomenon And it is very important to have sufficient knowledge of its various fields of application. In this regard, the research paper is in different fields and basic and applied research is often not at the stage. It is not a secret that teaching nanotechnology will soon be mandatory in most engineering and architecture curricula. It is also generally accepted as one of the key periods of threat in architecture. The need to develop an understanding of this general theme for future architectures cannot be questioned. Therefore, the purpose of this article is to connect science and technology under the umbrella of nanotechnology in order to design and manufacture practical and innovative materials and devices from the nano scale up. The findings of this article are expected to benefit nanotechnology in architecture and building materials, which directly or indirectly contributes to its suitability and the use of modern materials.

Key words: Building, Architecture, Materials, Modern, Nano Technology.

1. Bachelor's Degree Student, Architectural Professional Engineering and Islamic Azad University, Tabriz Branch, Iran
2. PhD Student in Urban Planning, Islamic Azad University, Central Tehran Branch, Tehran, Iran

Originates of the nonextensivity of internal energy in nanoclusters

Mozhgan Sabzehzari*[1]

Abstract

In this study, we have compared the effects of two different correlations, statistic(dynamic) and microscopic (interaction) correlations on the nonextensivity of internal energy. A composed system from N independent and identical harmonic oscillator in Tsallis statistical framework, has been considered as an example for a system with statistic correlation. For such a system, nonextensivity originates from Tsallis statistic in definition of the entropy, by entropic index, q. To study the nonextensivity from microscopic correlations, the nanoclusters with different interactions have been selected. Our study shows that in some cases it is possible to present the microscopic nonextensivity in the dynamic nonextensivity by defining an entropic index, q, for example with q slightly greater than unity for L.J nanoclusters. In this article we have shown that the nonextensive vibration partition function of harmonic oscillator in Tsallis statistical mechanics may be used for prediction of the behavior of the L.J nanoclusters, for example for sub-extensivity of the configuration energy.

Keywords: Nano clusters, nonextensivity, Tsallis statistical mechanics

1. Department of Chemistry, Isfahan University of Technology, Isfahan, Iran, 8415683111

How atomic impurities affect the electrical and optical properties of BeO nanotube

MozhganSabzehzari[1]*

Abstract

In this research, the density functional theory (DFT) method was used to study the structural,
electrical, linear and nonlinear optical (NLO) properties of pristine and B, Al and Ga doped BeO
nanotube. Slight structural deformation, as the consequence of doping atom presence, was observed. The dipole moment of BeO nanotube was increased in the doping atom presence. In the B, Al and Ga atoms presence, a kind of reduction in Eg of nanotube was observed in which, in B case, the decrease in Eg was more substantial. In this sense, it is worth noting that higher electrical conductivity is associated with lower Eg. The two CAM-B3LYP and WB97XD methods were used to calculate the optical properties of pristine and doped BeO nanotubes. It was shown that the polarizability of nanotube was slightly increased in the doping atoms presence. Besides, the B<Al<Ga order was applied for the polarizability increasing. According to the findings of the research, the doping atoms extremely influenced the value of the first hyperpolarizability of BeO nanotube. The results would be useful in designing and constructing new NLO active materials.

Keywords: BeO nanotube; density functional theory (DFT) method; structural properties; electrical properties; optical properties.

1. Department of Chemistry, College of Basic Science, JundiShapur University of ThechnologyDezful, Dezful, Iran,

Synthesis and microbial study of Ch@ZnO@EO bio-nano composite film for use in food packaging

Amir Salamian naseriyan[1], Raheleh Safaeijavan[2*],
Shohreh Zare karizi[3]

Abstract

The role of nano technology in the new generation of active packaging in order to increase the shelf life of products is significant. The first goal of this research is the biosynthesis of chitosan-zinc oxide-peppermint essence nanocomposite (Ch@ZnO@EO) and investigate its antimicrobial effects on *Staphylococcus aerogenes, Enterobacter aerogenes, Pseudomonas aeruginosa, Escherichia coli* bacteria. In this study, first by extracting peppermint plant extract, zinc oxide nanoparticles were biosynthesized and characterized by electron microscope test, X-ray diffraction, UV visibe measurement. Then, using the synthesized nanoparticles to prepare 3 groups of nanocomposite films: chitosan film, chitosan@ZnO nanoparticles film, chitosan@ZnO@EO film. To check the physical and chemical properties of these nanocomposites, electron microscope, FTIR, thermal gravity, and tensile tests are used. their antimicrobial property has been evaluated by disk diffusion method.

Nanoparticles synthesized by green method had size values of 14.38 ± 43.79 nm. EDS analysis confirmed the presence of major elements of zinc with 87.5%. In the XRD test, the diffraction peaks were consistent with the crystal structure of ZnO. In the investigation of nanocomposite films, the electron microscope images showed that roughness were created in the films by adding zinc oxide. In the FTIR group of nanocomposite samples, the functional groups related to the chitosan, Zn-O band and the essential oil shown in the respective samples. In investigating the antimicrobial properties of nanocomposite films, in the Ch@ZnO@EO film was observed an aura of non-microbial growth on the 4 studied bacteria, which indicates the appropriate antimicrobial effect of the prepared film. Overall results showed that Ch@ZnO@EO nanocomposite film can be used as a suitable antimicrobial film in the food packaging industry.

Keywords: ZnO nanoparticle, chitosan, green synthesis, packaging, nanocomposite film

1. Department of Biology, Varamin Pishva Branch, Islamic Azad University, Varamin, Iran
2. Department of Biochemistry and Biophysics, Varamin Pishva Branch, Islamic Azad University, Varamin, Iran
3. Department of Biology, Varamin Pishva Branch, Islamic Azad University, Varamin, Iran

Investigating and Studying the Effects and Application of Nanotechnology in Agriculture

Mohammad Salehi avval*, Amirmohammad Bahramimaddah[1]

Abstract

Nanotechnology is a new technology that will affect all sciences. This technology is able to improve the existing conditions in most sciences and will provide opportunities for the production of new products. Nanotechnology is actually engineering at the level of an atom or a group of atoms. Nanotechnology is not a new field, but a new approach in all fields. Therefore, the science of nanotechnology has the ability to produce new materials, tools and systems to take control at the molecular and atomic levels by using the properties that appear on those levels. The present article is a kind of review article that examines the interaction of nanotechnology with agriculture. The application of nanotechnology in agriculture has not been focused. Therefore, in the field of agriculture, there is a lot of potential for progress and advancement of sustainable and innovative agricultural goals. It is hoped that nanotechnology will reach its true position in the field of agriculture with the support that will take place in different dimensions and levels in the future.

Keywords: Nano, nano technology, agriculture, nano application.

1. Bachelor student of Chemistry Education, Farhangian University, Allameh Amini Campus, Tabriz, Iran.

Reviewing and investigating Students' Misconception in High School Chemistry Education

Mohammad Salehi Avval[1]

Abstract

Misconceptions refer to any kind of false notions that cause non-scientific beliefs, confused concepts, simple concepts and theories without scientific roots. Misconceptions cover a wide range of scientific concepts. Misconceptions not only in chemistry, but in other fields at all levels cause major problems for science educators, scientific researchers, teachers and students. If the concept in Abstract and incomprehensible concepts, it will be much more necessary to recognize Misconceptions and deal with them. The present article, is a kind of review article in which the subject of common Misconceptions of students in teaching chemistry in the high school has been discussed. In explaining chemistry concepts, vague terms and definitions should not be used and clear and understandable explanations should be used. Teachers should refrain from providing redundant data to students. It is also a very good solution for teachers to be familiar with different types of misconceptions in different lessons.

Key words: Misconception, Chemistry education, Chemistry, education.

1. Bachelor student of Chemistry Education, Farhangian University, AllamehAmini Campus, Tabriz, Iran.

Hydrogen sensitivity of steel nanoparticles in the structure of nuclear fusion reactors

Mohammad Azizimanesh*

Abstract

In South Korea, the effects of hydrogen on the mechanical properties of nuclear fusion reactors were studied using steel nanoparticles (Y2O3) reinforced with dispersed oxide (ODS) in in situ tensile tests under the influence of high pressure hydrogen gas. In these tests and studies, the hydrogen desorption properties of steel were measured using thermal desorption spectrometry analysis. Steel nanoparticles with sizes of five to one hundred and fifty nanometers were prepared and then processed with mechanical alloyers and hot isostatic pressing. Steel nanoparticles reinforced with (ODS) showed strong tensile properties in the presence of gaseous hydrogen and less sensitivity to hydrogen.

Steel was tested and studied a lot as a candidate to be placed in the structure of fusion reactors, which is supposed to be exposed to hydrogen in this reactor. Obviously, the results obtained in this research will have a positive effect on the design criteria used in the construction of fusion reactors.

Keywords: Hydrogen, embrittlement, Mechanical propert,y Thermal desorption spectroscopy, Nano-sized oxide, Austenitic steel

Synthesis of Gamma Alumina Nanoparticles and Studying its Effect on the Removal of some Textile Cationic Dyes from Industrial Effluents

Masoud Saadadi [1*], Salva Sadigzadeh [2], Mortaza Iranifam [3]

Abstract

The present study investigates the removal of cationic textile dyes by gamma alumina nanoparticles modified with surfactant. The use of alumina nanoparticles with an anionic surfactant (sodium dodecyl sulfate) as a new and efficient adsorbent has been successfully performed to remove two dyes, basic yellow 28 and basic blue 41, from aqueous solutions of textile industrial effluents. The concentration of dyes was determined using spectrophotometric method and it was found that dye removal using modified nanoparticles is performed better than unmodified nanoparticles. The obtained data from scanning electron microscope, X-ray diffraction and Fourier transform infrared spectroscopy of the synthesized nano-alumina showed that surface of the nanoparticles was modified correctly. The effect of different parameters such as contact time, initial concentration of dyes, amount of adsorbent used, solution pH, temperature, interference of ions and other dyes on the removal of the studied dyes were investigated. Optimum conditions were investigated and determined by the response surface method (RSM), by studying four factors of contact time, initial concentration of dye, amount of adsorbent and pH of the effluent sample at three levels. The removal rate of the studied dyess in optimal conditions was over 94%.

Keywords: Gamma alumina nanoparticles, Dye removal, Cationic dye, Industrial effluents, Spectrophotometry

1. Department of Science, Farhangioan University, Tabriz, Iran
2. Department of Chemistry, Marageh University, Marageh, Iran
3. Department of Chemistry, Marageh University, Marageh, Iran

Optimizing CZTS solar cell and investigating the effect of temperature on its efficiency using scaps-1d software

Seyed alireza rasoli*[1], Somayeh Salmani[2]

Abstract

In this article, we investigate the performance of CZTS thin film solar cell with Zno/Cds/CZTS structure. The cost of making solar cells in the laboratory and checking it requires a lot of money and time, that's why we used the scaps-1d software to conduct this review theoretically. At first, we simulated a prototype of the solar cell structure, and then by changing the thickness of the CZTS and Cds layer, we obtained the best thicknesses, and then we simulated our optimized solar cell by comparing the efficiency of two different modes for the desired structure. , we observed a nearly 4% increase in efficiency, and then by changing the temperature parameter, we checked its effect on the efficiency and it was observed that the efficiency increases with the decrease in temperature and the efficiency decreases with the increase in temperature.

Key words: Thin film solar cell, CZTS, scaps-1d, solar cell simulation, efficiency increase, temperature effect

1. Photonics Laboratory, Faculty of Physics, Kharazmi University, Karaj, Iran
2. Photonics Laboratory, Faculty of Physics, Kharazmi University, Karaj, Iran

Investigation of nanofluid viscosity

Kimia Fotovvat*[1], Amir Hossein Yavari[2]

Abstract

Nanofluid is a solid-liquid mixture consisting of nanoparticles (particles 1 to 100 nm in size) and a base fluid. Nanofluids have useful applications in many important fields such as heat transfer technologies, automotive industries, electronics industries, medicine, military industries, cleaners, etc; Therefore, in this study, the viscosity of nanofluids has been considered as one of the thermophysical parameters of nanofluids. Different classical models have been proposed to predict the viscosity of nanofluids; So far, no acceptable classical model has been proposed that can accurately predict the viscosity of nanofluids. Studies show that various parameters such as base fluid, temperature, nanoparticle size, nanoparticle shape, volume fraction of nanoparticles and pH, affect the viscosity of nanofluids; Therefore, the study of the effect of these parameters on the viscosity of nanofluids in order to exploit their potential in a wide range of applications is of particular importance and researchers to develop viscosity models to achieve more accurate results in predicting the viscosity of nanofluids. Nanofluids based on their experimental data.

Keywords: Nanofluids, Nanoparticles, Thermophysical Parameters, Viscosity.

1. *. Ph D student in Chemical Engineering, University of Tabriz
2. Master's student in polymer engineering, Amirkabir University

Synthesis of silver nanoparticles from aqueous extract of Lycopus europaeus L with chitosan polymer and characterization of its physicochemical properties

Ayda Khalaj, Seyed Amir Hossein Mohammadzadeh Hosseini Moghri, Mojtaba Ranjbar*[1]

Abstract

Nowadays, nanoparticles are the most common elements in science and nanotechnology, and their interesting properties have made them have many diverse applications in chemical, medical and pharmaceutical, electronic, and agricultural industries. Biosynthesis of silver nanoparticles using plants is an environmentally friendly and cost-effective method compared to chemical methods. The purpose of this research is the biosynthesis of silver nanoparticles using the aqueous extract of Lycopus europaeus L and its physicochemical properties. In recent years, with the development of nanotechnology, a lot of research has been done on the use of biological nanocarriers for the targeted delivery of drugs. Considering that one of the urgent needs of modern medical science is the production of drug carriers with higher half-life and fewer side effects, for this purpose we coat nanoparticles with chitosan polymer. Next, we examined the characteristics of the synthesized nanoparticles by means of EDAX, TEM, FTIR, and XRD analyses. The examination of the transmission electron microscope result of silver oxide nanoparticles with chitosan polymer indicates their mostly spherical shape and the size of the nanoparticles with a size of less than 20 nm was observed. In addition, the result of FTIR absorption in the peaks of 3421 cm-1 and 2924 cm-1 is characteristic of CH stretching vibrations of polyalkenes and OH bonds of phenolics (such as flavonoids and flavonols). In addition, the presence of the 1608 cm-1 peak indicates an amide bond. Also, the presence of the 1403 cm-1 peak is related to the COO bond. Finally, the absorption range of 1076 cm-1 indicates CO stretching vibrations in oligosaccharides, and absorption at 586 cm-1 is the result of the

1. Department of Microbial Biotechnology, Faculty of Biotechnology, Amol University of Special Modern Technologies,Amol, Islamic Republic of Iran

formation of silver nanoparticles. Also, the 3424 cm-1 peak, in addition to being related to the vibrations of the O-H group of absorbed water molecules, also represents the amino groups of chitosan. The result of X-ray energy diffraction spectroscopy of the silver oxide nanoparticles with chitosan polymer showed that this nanoparticle has 23% carbon, 10% nitrogen, 49% oxygen, 0.1% phosphorus, 0.6% sulfur, and 14% silver. Finally, based on the XRD results, the presence of common peaks at 37.9°, 44° and 64° in silver oxide nanoparticles with peaks at 33°, 47° and 61° in the nanopolymer indicates the binding of chitosan to silver nanoparticles and a confirmation of the successful synthesis of the nanopolymer.

Keywords: silver nanoparticles, green synthesis, Lycopus europaeus L, chitosan, physicochemical properties

Investigating the antimicrobial and anticancer effects of silver nanoparticles coated with chitosan

Seyed Amir Hossein Mohammadzadeh Hosseini Moghri, Ayda Khalaj, Mojtaba Ranjbar*[1]

Abstract

Recently, nanoparticles are the most common elements in science and nanotechnology, and green synthesis of silver nanoparticles is an environmentally friendly and cost-effective method compared to other methods. The aim of this research is the biosynthesis of silver nanoparticles using the aqueous extract of Lycopus europaeus L and investigating its anti-bacterial and anti-cancer properties. In the present study, considering that one of the urgent needs of modern medical science is the production of drug carriers with higher half-life and fewer side effects, for this purpose, we coat nanoparticles with Chitosan polymer. Nanoparticles alone or in the form of composites have been widely reported as potential antibacterial agents against Gram-positive and Gram-negative bacteria because they change the metabolic activity of bacteria. Based on this, the anticancer activity of synthetic nanoparticles on breast cancer cell line (MCF-7) was investigated using the common cytotoxicity test of biological substances via the MTT method in vitro. Based on the necessary investigations of the physicochemical properties of the synthesized nanoparticles in previous research, we came to the conclusion that the anti-microbial and anti-cancer properties of the nanoparticles with the final polymer were investigated by disk diffusion method against two bacteria S.aureus (Staphylococcus aureus) and E.coli (Escherichia coli) and also against breast cancer cell line (MCF-7) in comparison with normal mouse fibroblast cells (L929). Therefore, the antibacterial activity of silver oxide-Chitosan nanoparticles It showed the greatest effect on E. coli at a concentration of 10 mg/ml and the least effect on S. aureus at a concentration of 2.5 mg/ml. The results of the anti-cancer test showed that nanoparticles lead to the death of a higher percentage of cells after 24 hours, so at a concentration of 500 μg/ml

1. Department of Microbial Biotechnology, Faculty of Biotechnology, Amol University of Special Modern Technologies,Amol, Islamic Republic of Iran

in the cancer cell line, it led to 43% lethality, while this rate in the normal cell line has decreased (18%). These findings provide a new strategy for the development of nanocarriers for the effective and targeted treatment of microbial and cancer cells.

Keywords: Chitosan silver nanoparticles, antimicrobial, anticancer

Improvement of the Wound Healing Process by Janus Nanofibrous Biomimetic Wound Dressings Containing Metal and Metal Oxide Nanoparticles

Shaghayegh Kohzadi[1], Zahra Mohammadi[*2]

Abstract

Since the beginning of time, humans have struggled with closing and healing wounds. Dressings are important in treating wounds, beacuse they prevent infection and speed up the healing process. Most dressings used for wound healing do not simulate the complex extracellular matrix (ECM) and therefore cannot provide a suitable site for wound healing. Biomimetic nanofibers have attracted much attention due to their attractive properties, such as their capacity to deliver bioactive agents, their high surface area, and their enhanced mechanical properties. To increase their capacity for wound healing, nanofibrous materials can be further encapsulated or loaded with metal nanoparticles. Recently, Janus nanofibers have attracted the attention of researchers due to their high surface area to volume ratio, high porosity, and matrix morphology similar to human extracellular matrix. Furthermore, different types of active ingredients can be simultaneously loaded into the Janus structures, and their synergistic effect on the desired functional properties may be inhibited in the Janus structure contacting both sides of its environment. Attempts have been made to investigate the latest biomimetic Janus nanofibrous dressings made with metal and metal oxide nanoparticles and their effect on the wound-healing process.

Keywords: Wound Dressing, Biomimetic, Janus Nanofiber, Nanoparticle

1. Bioceramic and Implant Laboratory, Faculty of New Sciences and Technologies, University of Tehran, Tehran, Iran
2. Bioceramic and Implant Laboratory, Faculty of New Sciences and Technologies, University of Tehran, Tehran, Iran

Optical modulator based on SiC structure using VO_2 phase change material at 2.1 µm wavelength

Mobina Abbaspour, Mahmoud Nikoufard*[1]

Abstract

The wavelength of 2.1 µm is used in medicine, wind speed measurement, water vapor detection, and carbon dioxide concentration. In this article, for the first time, an optical modulator has been designed and simulated using VO_2 phase change material on a SiC waveguide structure at a wavelength of 2.1 µm. This research aims to investigate the structure of the waveguide and obtain the optimal thickness of the SiC waveguide layer at a wavelength of 2.1 µm. Then, by using the VO_2 phase changer, it has been tried to use this structure as an optical modulator. In the performed simulations, the graph of effective refractive index was calculated according to the thickness of the SiC core layer, and from that, the optimal thickness of the SiC layer was calculated using the confinement factor of the waveguide layer equal to 400 nm. Then the waveguide coating layer was replaced with VO_2 phase change material. By changing the VO_2 phase from insulator to metal and vice versa, an optical modulator is obtained. The important parameters of the optical modulator, including the real and imaginary part of the effective refractive index, were obtained by changing the VO_2 thickness, as well as the light emission at a wavelength of 2.1 µm for TM and TE polarizations.

Keywords: silicon carbide, optical modulator, 2.1 µm wavelength, phase change material, vanadium dioxide.

1. Kashan, University of Kashan , Faculty of Electrical and Computer Engineering, Department of Electronics

Kinetic study of chlorogenic acid loading onto folic acid and polyvinylpyrrolidone modified magnetic carbon nanotubes

Mahsasadat Miralinaghi*[1]

Abstract

Cancer is known as the main factor threatening the health of humanity in the contemporary world. In this research, polyvinylpyrrolidone and folic acid-modified magnetic carbon nanotubes (FMSP) were prepared and used for loading the anticancer agent, chlorogenic acid (CGA). The chemical structure of FMSP was investigated by Fourier transform infrared spectroscopy (FTIR) analysis. Parameters affecting drug adsorption capacity by synthesized nanocomposite, including pH, contact time, and FMSP dosage, were studied. The adsorption capacity of FMSP for drug was higher at an acidic pH and at lower doses of FMSP. Pseudo-first-order and pseudo-second-order kinetic models were developed to predict the rate constants and equilibrium capacities of adsorption using a linear regression method. Adsorption experimental data showed a better fit with the pseudo-second-order kinetic model. By decreasing the dose of FMSP, the rate of the drug loading process increased. The results showed that synthesized FMSP is a suitable adsorbent for fast loading of CGA, an anticancer agent.

1. *Department of Chemistry, Faculty of Science, Varamin - Pishva Branch, Islamic Azad University, Varamin, Iran

Adsorption of silibinin onto a biodegradable polymer modified carbon nanotubes: Kinetic and isotherm study

Mahsasadat Miralinaghi*[1]

Abstract

Cancer is the second-most common disease in the world and has a mortality factor of about 0.3 million worldwide. Silibinin is used to treat cancers of the breast, bladder, prostate, skin, intestine, lung, liver, and kidney. In this work, the effectiveness of polyethylene glycol and polyethylene imine grafted magnetic carbon nanotubes (PGCS) for the adsorption of the anticancer agent, silibinin (SB) was studied. The types of functional groups present in PGCS were identified by Fourier transform infrared (FTIR) spectroscopic analysis. The effect of parameters such as contact time and initial concentration of SB on drug adsorption onto synthesized nanocomposite was investigated. The results showed that with increasing the contact time (until reaching equilibrium) and the initial concentration, the amount of drug adsorption increases. The kinetic experimental data for SB adsorption onto PGCS fit well with the pseudo-second-order kinetic model, while the equilibrium experimental data followed the Langmuir isothermal model. Based on the obtained outcomes, the synthesized nanocomposite has a reasonable adsorption capacity for silibinin loading in aqueous solution.

1. *Department of Chemistry, Faculty of Science, Varamin - Pishva Branch, Islamic Azad University, Varamin, Iran

Investigating the ability of Lysobacter protease in the formation of nanoparticles using computational methods

Omid Ali Behzadi, Azizeh Asadzadeh*[1]

Abstract

The presence of hydrophobic parts and the ability to interact with glutaraldehyde may lead to protein-assembly and nanoparticle formation. The aggregability of an enzyme increases its stability for industrial uses. This article investigates the aggregation potential of the Lysobacter protease enzyme (Alpha- Lytic protease). The genus Lysobacter belongs to the family Xanthomonadaceae within the Gammaproteobacteria and includes at least 46 named species.

The first maximal score value of aggregation of Alpha- Lytic protease and also Beta- Clamp, and Amyloid as standard proteins were obtained by the Aggrescan 3D software. In order to investigate the mode of interactions among Glutaraldehyde and Alpha- Lytic protease, the Glutaraldehyde structure was designed in the ChemDraw program and then energy was minimized in HyperChem. Finally, by using the AutoDock program, Glutaraldehyde docked into the Alpha- Lytic protease, Beta- Clamp, and Amyloid.

The maximal score value of Alpha- Lytic protease by Aggrescan 3D software was 2.9421 that higher than Beta- Clamp, and Amyloid as standard proteins. Glutaraldehyde successfully docked into Alpha- Lytic and made van der Waals bonds with Arg 82 and Val 84.

according to the observed information, Lysobacter's protease enzyme has hydrophobic parts and interacts with Glutaraldehyde. Therefore, this enzyme shows appreciable aggregation property in computational studies.

Key words: nanoparticles, Lysobacter, aggregation, Glutaraldehyde, bioinformatic study

1. Department of Biology, Faculty of Basic Sciences, Nourdanesh Institute of Higher Education, Meymeh, Isfahan, Iran

Nanotechnology in food industry

Samin Adineh[1]

Abstract

Nanotechnology is a field of science and technology that involves the biofabrication of nanoscale materials and/or the engineering of functional systems at the molecular level. Research findings show the merit of nanotechnology in various sectors including food, textiles, concrete, paper and pulp, agriculture, transportation, energy, information technology and medicine. Nanobiotechnology is a relatively new area of the food sector in which nanostructures are used for pathogen detection by nanosensors and nanotracers, nanoencapsulation, targeted delivery and control, food processing, food preservation, nanofertilizers, nanoadditives, nutrient production, and smart packaging. . Various nanoparticles such as gold, silver, zinc, iron, titanium dioxide, nanorods, nanoshells and quantum dots due to their antibacterial, antifungal and pathogenic properties, interaction of nanoparticles with the microbial cell membrane through electrostatic interaction, accumulation in Cytoplasm and various organelles are used in the food sector.

Key words: nanotechnology, nanobiotechnology, nano in food industry, nanocapsule, nanosensor, nanostructure

1. Master student of Food Chemistry, Department of Food Science and Industry, Faculty of Agriculture, Tabriz University

Impedance Spectroscopy of PVA/GO Nanocomposites by Considering GO Intrinsic Resistivity

Parsa Dadashi[1], Mehdi Elhamnia[2] ,Ghodratollah Hashemi Motlagh[3]*

Abstract

This study investigates the electrical properties of polyvinyl alcohol-graphene oxide (PVA-GO) nanocomposites. PVA-GO samples with different concentrations of GO (5%, 10%, 15%, and 20 wt%) were prepared and characterized using various techniques including Fourier transform infrared spectroscopy, scanning electron microscopy, impedance spectroscopy, and dielectric spectroscopy. The results showed that increasing the concentration of GO in PVA-GO samples leads to a decrease in the electrical resistivity. The electrical percolation threshold was detected near 15 wt% of GO. Furthermore, the impedance spectroscopy analysis revealed that the sample with 20 wt% of GO has the lowest real impedance, indicating a higher electrical conductivity. The results show that GO is neither an electrically conductive filler nor an excellent insulating material. Excellent dispersion of GO in PVA due to their very good interactions does not provide a complete percolation curve saying that electrical conductivity of filler has strong effect on the location of percolation point. Furthermore, impedance spectroscopy analysis revealed that the sample containing 20 wt% of GO exhibited excellent dielectric response.

Key words: Impedance spectroscopy, GO, Percolation threshold, Nyquist plots, PVA

1. Advanced Polymer Materials & Processing Lab, School of Chemical Engineering, College of Engineering, University of Tehran, Tehran, Iran
2. Advanced Polymer Materials & Processing Lab, School of Chemical Engineering, College of Engineering, University of Tehran, Tehran, Iran
3. Advanced Polymer Materials & Processing Lab, School of Chemical Engineering, College of Engineering, University of Tehran, Tehran, Iran
Azmoon Dana Plastic Co. (testing/research/training lab), 3rd Sanaat St., Shahr-eQods, Tehran, Iran * corresponding author: G.H. Motlagh

Investigating the Impact of Polymer/Nanoparticles Interaction on the Impedance Properties

Parsa Dadashi[1],Ghodratollah Hashemi Motlagh[2]*

Abstract

In this study, interaction between polymer and nanoparticles effect on impedance properties was studied. The nanocomposites of Polypropylene (PP), Poly (Propylene- grafted maleic anhydride) (PP-g-MA), and Poly (Ethylene- Vinyl Acetate) (EVA) with different surface energies, containing Multiwalled Carbon Nanotubes (MWCNTs) were prepared by melt mixing. Thermodynamic affinity between MWCNTs and polymers were estimated by thermodynamic equations. According to that, PP, PP-g-MA, EVA interfacial tensions with MWCNTS were estimated as 13.07, 8.1, and 2.1, respectively. Optical micrographs showed that the dispersion of MWCNTs in PP, PP-g-MA, and EVA polymers is influenced by the interfacial tension between the polymer and MWCNTs. Poor dispersion was observed for PP, attributed to weak interaction and high crystallinity. The percolation threshold of PP and PP-g-MA was lower than that of EVA due to weak interactions between MWCNTs and PP and the formation of an interconnected structure between the nanoparticles, as well as the high crystallinity of PP leading to a phase segregation structure in the polymer. According to impedance measurements, PP exhibited the highest critical frequency (fc) due to its interconnected structure resulting from phase-segregated structure and weak interactions with MWCNTs. The existence of more conductive pathways in PP compared to EVA was validated by peak shifting to high frequencies and decline in peak height. EVA exhibited the best electromagnetic interference shielding capability among PP, PP-g-MA, and EVA samples, as indicated by the higher loss tangent of impedance.

Key words: Interfacial tension, MWCNTs, Impedance, EMI shielding, Percolation threshold.

1. Advanced Polymer Materials & Processing Lab, School of Chemical Engineering, College of Engineering, University of Tehran, Tehran, Iran
2. Advanced Polymer Materials & Processing Lab, School of Chemical Engineering, College of Engineering, University of Tehran, Tehran, Iran
Azmoon Dana Plastic Co. (testing/research/training lab), 3rd Sanaat St., Shahr-eQods, Tehran, Iran * corresponding author: G.H. Motlagh

Modification of cotton fabric properties by green synthesis of MnO_2 nanoparticles

Hamid reza jafari*, Hanieh afrasiabi, Elaheh bahman abadi[1]

Abstract

Along with good features such as comfort, air permeability and water absorption, cotton textile have some inherent weaknesses such as a suitable for the growth of bacteria, low UV protection factor, wrinkling and high flammability. Different technologies including nano finishes can be used to improve these problems. reduction of potassium permanganate is a suitable method for the synthesis of MnO_2 nanoparticles, in this research, cinnamon extract was used as a green reducer and stabilizer, and MnO_2 nanoparticles were in situ synthesized through the reduction of potassium permanganate. Using FESEM, EDX and Map tests, the synthesis and uniform presence of nanoparticles on the fiber surface was confirmed. The conducted studies show that it has a flame retardant and UV protection property. Also, the results related to the wrinkle resistance angles proved that the samples modified with nanoparticles are somewhat resisting to wrinkle compared to the raw samples. As a result, manganese dioxide nanoparticles can be used to improve the properties of cotton textiles with high efficiency and stability.

Keywords: Cotton fabric, Green synthesize, MnO_2 nano particels, Multi functional properties, Textile nano finishing

1. Department of Textile Engineering, Amirkabir University of Tecnology (Tehran Polytechnic)

Surface modification of cotton fabric with MnO_2 nanoparticles to oil/water separation and achieve self-cleaning property

Hamid reza jafari*, Hanieh afrasiabi, Elaheh bahman abadi[1]

Abstract

Spill and leakage of oily and petroleum substances in waters destroys the ecosystem and threatens the health of living beings. Among all methods absorption and filtration processes have been highly effective in cleaning oily pollutants. By performing hydrophobic finishes on various textiles such as cotton fabrics, due to their cheapness, availability, biodegradability and flexibility, they can be used to separate oily pollutants from water. In this research, by using potassium permanganate as a precursor, manganese dioxide nanoparticles were in situ synthesized in an acidic solution on cotton fabric, and nano-scale roughness was created on the surface of the fibers. Using SEM images and FTIR test, the presence and uniform distribution of nanoparticles was confirmed. The created nano-roughness creates a hydrophobic property and due to the absorption of oil by the modified fabric, it can be used to separate oily substances from water. Also, due to the photocatalytic property of manganese dioxide nanoparticles and surface hydrophobicity, self-cleaning and anti-stain properties were created in the fabric. The studies conducted show that the modified fabric has a high ability to oil/water separation and it also has the photocatalytic activity.

Keywords: oil/water separation, MnO_2 nano particels, hydrophobicity, photocatalytic activity, self-cleaning property

1. Department of Textile Engineering, Amirkabir University of Tecnology (Tehran Polytechnic)

Investigating the reactivity of drug enantiomers ، of modafinil in the adsorption process on chiral carbon nanotubes by density functional theory method

Kosar Mohammadi*, Hossein Nikofard, Mohsen Sargolzaei[1]

Abstract

Research shows that many biological reactions in the body are space-consuming. Most biological compounds such as enzymes have different reactions for their racemic forms. For this reason, the separation of pharmaceutical enantiomers has become an important issue in the pharmaceutical industry. The main goal of this research is to investigate the reactivity of the drug enantiomers of modafinil before and after adsorption on chiral carbon nanotubes (7 and 8) with a diameter of 15 angstroms using density functional theory calculations. Modafinil is one of the racemic drugs available in the market in two forms: RModafinil and Modafinil (SModafinil). Many pharmaceutical factories produce this drug in the form of a combination of both enantiomers, and some other enantiomers of the drug are separated from each other. The common methods of separating the enantiomers of the drug Modafinil are based on chromatography. But the obtained results showed that the simulation of molecular docking is a suitable method for the separation of medicinal enantiomers. Chiral carbon nanotube was used to separate enantiomers. Based on the results, carbon nanotube (7 and 8) has a good interaction with the turn left and turn right enantiomers of the drug Modafinil and is suitable for separation. In order to investigate the interaction and reactivity of drug enantiomers, calculations of binding energy, bonding natural orbitals and diagrams of electrostatic potential levels of drug enantiomers before and after absorption were investigated. Calculations were performed using density functional theory at the B3LYP/6-31G theoretical level. The research results show that the R enantiomer has better stability and minimum energy level after being absorbed on the nanotube. Also, most of the active and reactive points are located in the place of the functional groups.

Keyword: Modafinil, enantiomer, carbon nanotube, reactivity, density functional theory, bonding natural orbitals

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1. Faculty of Chemistry, Shahrood University of Technology, Shahrood, I.R. Iran

Studying the process of separation of enantiomers of the drug Modafinil by chiral carbon nanotubes using molecular docking simulation

Kosar Mohammadi*, Hossein Nikofard, Mohsen Sargolzaei[1]

Abstract

Enantiomeric compounds are mirror images of each other and many of their physical and chemical properties are the same. The biological function of and left-round and right-round drug enantiomers is different in the body. In such a way that each of the enantiomers shows a separate behavior in dealing with biological molecules. For this reason, the separation of pharmaceutical enantiomers is one of the concerns of pharmaceutical industries and companies. The main goal of this research is to find the most optimal nanotube structure with specific diameter and dimensions for the separation of enantiomers of the drug Modafinil. To reach this goal, the binding energy of different drug enantiomer interactions with nanotubes was investigated. Also, the position of right and left enantiomers inside and outside the nanotube was studied and the energy difference of both enantiomers was compared. The performance of a number of chiral carbon nanotubes from diameter 11 to 15 with dimensions m and n (7,6), (8,7), (9,8) and (10,9) was investigated using molecular docking simulation. The results showed that the nanotube (8,7) with a diameter of 15 angstroms has a better ability to separate the enantiomers of the drug Modafinil. Also, a significant energy difference between the left-round and right-round enantiomers was observed in the nanotube (8,7) with a diameter of 15. The location and energy difference of left-round and right-round enantiomers showed that the above nanotube can be used as a suitable carrier for modafinil drug enantiomers.

Keyword: molecular docking simulation, separation of enantiomers, chiral carbon nanotube, modafinil, pharmaceutical enantiomers

1. Faculty of Chemistry, Shahrood University of Technology, Shahrood, I.R. Iran

Thermal management optimization of car battery using nano-pahse change materials composite

Aref lavaei eisaloo , Dr.fahimeh hooriabad saboor , Dr.aziz babapoor , Dr majid safajou jahankhanmlou

Abstract

Battery is an energy storage system, which widespread use in vehicles has led to the use of batteries with high energy. The most important part of the battery industry is the use of a thermal management system for temperature control. Such a system should be able to create a uniform temperature distribution in addition to reducing the temperature of the whole assembly. To realize it, phase change materials (PCM) can be used. The use of phase change materials causes high thermal conductivity, reducing the cost of effective investment and reducing energy loss. Using these materials is one of the best ways to store renewable energy in the future. Due to high energy storage in PCM, high energy can be stored using it. Heat storage is done through three types of solid-solid, solid-liquid and liquid-gas phase changes. Phase change from solid to liquid, which is the most appropriate type, is one of the characteristics of PCM phase change materials.

In this article, the performance of nanocomposite of phase change materials has been investigated using various nanomaterials. In this review, the results of experimental studies using various types of nanocomposites have been carried out. Also, theoretical and simulation studies and models presented in the field of battery energy management have been discussed and evaluated. The results of battery thermal management using nanocomposite of phase change materials are more favorable than using liquids or air as a coolant. By using nanocomposite of phase change materials, the possibility of energy optimization in the battery increases. Also, the battery life has been increased accordingly.

Nano-Biotechnology: A Promising Approach for Solving Environmental Challenges

Hamed Faramarzi[1,*], Farzad Naghibzade[2]

Abstract

Nano-biotechnology has emerged as a promising field that combines nanotechnology and biotechnology to develop new materials, devices, and systems with a wide range of applications. This paper aims to explore the environmental applications of nano-biotechnology, focusing on the current state of knowledge and the limitations of existing research. In this paper, we review the literature on the environmental applications of nano-biotechnology and provide an in-depth analysis of the different applications, including water purification, air filtration, waste management, and soil remediation. Our findings highlight the potential of nano-biotechnology to address some of the most pressing environmental challenges of our time, and we provide recommendations for future research in the field.

Keywords: Nano-biotechnology, Environmental challenges, Pollution control, Nanomaterials

1. Chemical engineering department, Razi University
2. Head of process department, Kordestan petrochemical company

Development of poly(N-ethylpyrrole)/modified carbon nanotubes fiber for microextraction of polycyclic aromatic hydrocarbons in contaminated waters

Mansoureh Behzadi*[1]

Abstract

The waters and wastewaters around industrial areas are heavily polluted and have adverse effects on the ecosystems. This work is mainly focused on the electropolymerization of N-ethylpyrrole (NEtPy) and co-deposited on a stainless steel wire along with modified carbon nanotubes (mCNTs). The prepared nanocomposite was applied as a novel coating for head-space solid-phase microextraction (SPME) of some heavy polycyclic aromatic hydrocarbons (PAHs) from aqueous media prior to gas chromatography-mass spectrometry (GC-MS). To obtain an effective coating, several factors related to the electrochemical process were investigated and the optimized. Characterization for chemical structure of the synthesized PNEtPy/mCNTs nanocomposite was conducted with Fourier transform-infrared (FT-IR) spectroscopy. Scanning electron microscopy (SEM) was accomplished for observing the surface morphology of the coating. Some items involved in microextraction process were also checked in details. Under optimized case, validation parameters were assessed. Low detection limits (0.4 and 4.3 pg mL^{-1}) and good repeatability were achieved. The method was utilized to analyses contaminated real samples such as wastewater samples from Coal Processing Industries and agricultural water samples collected from the vicinity of the industry in different seasons. High recoveries were obtained, finally.

Keywords: Wastewaters, Polycyclic aromatic hydrocarbons, Nanocomposite, Solid-phase microextraction.

1. Department of Mining Engineering, High Education Complex of Zarand, Shahid Bahonar University of Kerman, Kerman, Iran

Turning Black Holes into Dark matter

M. W. Alhamd[1] , Murtadha Adhab Sayah[2], M.Katea.Al-Gharrawy[3]

Abstract

Dark matter may be a major component of the universe, almost six times more ab- undant than conventional unmistakable matter. We degree the impacts of its mass, but it get away the telescopes. It has the disposition of emanating no radiation and interacting only by the activity of gravity. The most reason of this article is to undertake to reply what dull matter is: we guess that it is composed of mag- netically charged neutrinos, genuine attractive monopoles. But that requires a gigantic conceptual jump: Maxwell's laws must be altered and the electric charge gets to be a attractive charge. Deviated "reversed" Maxwell's laws would give the "dark" attractive charge that would supplant the electric charge. The exceptionally shape of the Dirac condition, which forced on standard matter that the molecule carries an electric charge and complies the central properties of the electron, would force within the dim matter that the "dark" molecule complies the most properties of a neutrino related with a attractive charge. The moment point of the article is to appear that dull matter is determined from dark gaps, primarily from dynamic supermassive dark gaps. This requires a moment conceptual jump: the skyline of the dark gap experiences a tall temperature and an seriously weight of attractive areas which cause a power outage and a stage move (or broken symmetry) when the matter crosses the skyline. The result may be a inversion of Maxwell's laws: a attractive charge is substituted for the electric charge, and the electric current gets to be a tributary of the attractive current. A third im- portant conceptual jump takes after: sterile attractive neutrinos made interior the dark gap would cross the skyline to the exterior to constitute dull matter.

Keywords: Dark Matter, Magnetic Monopole, Inverted Maxwell's Equations, Magneto-Electric, Dirac Equation, Magnetic Sterile Neutrino, Active BlackHole, Event Horizon

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1. Atomic Energy Commission , Directorate of Research and Development, IRAQ
2. Atomic Energy Commission , Radioactive Waste Directorate, IRAQ
3. Atomic Energy Commission , Directorate of Research and Development, IRAQ

Effect of Adding Alcoholic and Nano Alcoholic extract of Moringa oleifera Leaves to Drinking water on the Productive Performance of Laying Hens

Nihad Abdul–Lateef Ali[1], Dakhil Hasan Oraibi[2]

Abstract

This study was conducted at Department of Animal Production farm of the college of Agriculture / Al-Qasim Green University the experimental field during twelve weeks from 1/ 9 / 2020 to 23/ 11/ 2020. Aimed to was to know the effect of adding the alcoholic and nano alcoholic extract of Moringa oleifera leaves to drinking water on the productive performance of laying hens , The experiment included 120 laying hens of Lohmann brown at the age of 50 weeks . The breeding period was divided into 3 experimental periods (52-55) weeks, (56-59) weeks and (60-63) weeks of the hens age , distributed randomly to 15 pen with 5 experimental treatments for each treatment of 24 birds. Each treatment included three replicates per 8 bird . Experience treatments were as follows: First treatment: control group free from any addition . Second treatment: drinking water added 10 ml / liter of water from the alcoholic extract of Moringa leaves at a concentration of 1% . Third treatment: drinking water added 10 ml / liter of water to the alcoholic extract of Moringa leaves at a concentration of 2%. Fourth treatment: drinking water added 10 ml / liter of water from the nano alcohol extract of Moringa leaves at a concentration of 0.01% . Fifth treatment: drinking water added 10 ml / liter of water from the nano alcohol extract of Moringa leaves at a concentration of 0.02% , the main results of the study are as follows: Significant improvement ($p \leq 0.05$) for the fourth treatment in the percentage of egg production , the number of cumulative eggs, egg mass and feed conversion ratio compared to the first treatment (control group). The fifth treatment recorded the best shell thickness , Albumin height and Hu unit, with a significant difference ($p \leq 0.05$) compared to the first treatment (control).

1. Department of Animal Production, College of Agriculture, Al-Qasim Green University, Iraq.
2. Department of Animal Production, College of Agriculture, Al-Qasim Green University, Iraq.

Magnetite Nanoparticles effect on Iron Deficiency Anemia

Al-Zamely Oda Mizil Yasser[1], ABDULSAHIB S. JUBRAN[2], MAHDI H AL-AMMAR[3]

Abstract

The biosynthesis of nanoparticles by using microorganisms develops as an ecofriendly method for nanoparticle synthesis because of its cheap, simple and non-toxic. Iron supplement drugs such as ferrous sulphate is the most used drug for treatment of iron deficiency anemia, but this supplement report that can yield undesirable side effects. The nanoparticles are synthesized in this study were iron oxide and chitosan – iron oxide nanoparticles. The dose of nanoparticles has more bioavailability compare to ferrous sulfate. Furthermore, both doses of nanoparticles cause lower inflammation than ferrous sulfate and more efficiently restored of serum iron, ferritin and transferrin to normal range. According to the following, we was suggested the mechanism of Fe3O4 entered to the erythrocyte as figure in research content: • Coating with chitosan by formation chelating agent with iron. • Increased the levels of Malondialdehyde (MDA), Ferritin, Total Antioxidant Capacity, Serum iron. • Decrease the level of Transferrin. • Increase of Conductivity of erythrocytes. • Alteration of RBC shape band in UV-visible scan. • Changing in Electrophoresis of erythrocytes bands. Keywords: Iron deficiency anemia, ferrous sulfate, nanoparticle, chitosan

1. College of Science, University of Babylon, Babylon, Iraq,
2. College of Dentistry, University of Alkafeel, Najaf, Iraq,
3. Department of Biology, College of Science, University of Kufa, Najaf, Iraq

Synthesis of FWCNTs by Thermal Flame/Chemical Vapor Deposition from Kerosene at low Temperature

Aseel M. Ajobree[1], Firas H. Abdulrazzak[2], Ayad F. Alkaim[3], and Falah H. Hussein[4]

Abstract

We preparation a few walled carbon nanotubes FWCNTs of finite carbon structure consisting of filaments -like tubes by modifying chemical vapor deposition with the flame of kerosene. The flame method, used to modify chemical vapor deposition for synthesis nanomaterials. The FWCNTS were synthesized with incomplete combustion of kerosene to produce fragments of carbon free radicals which deposited chemically at 280°C. The characterization of function groups were done by Raman spectroscopy, FT-IR, and XPS. The crystallography and purity were characterized by XRD and thermogravimetric analysis TGA respectively, while the images of tubular structure were taken by scanning electron microscopy (SEM) transmission electron microscopy (TEM). The average outer and inner diameters of the FWCNTs were estimated to be 13 nm and 6 nm respectively with 4-7 graphene sheets. The length of tubes was more than 1 µm and 67.92% in purity of synthesized FWCNTs.

Keywords: Flam/CVD, FWCNTs, Kerosene, BVC, Support.

1. Babylon University ,College of Science for Woman, Iraq
2. Al-Karkh University of Science, College of Science,Iraq
3. Babylon University ,College of Science for Woman, Iraq
4. College of Pharmacy \ University of Babylon, Hilla, Iraq

Effect of Manufacturing Method on Optical Properties of PMMA

Hebatalrahman[1]

Abstract

In that work, the effect of different Manufacturing techniques of Perspex (PMMA) and PMMA matrix composite, and the conventional techniques for manufacturing PMMA were discussed, especially the casting method used in industry for manufacturing acrylic sheets. The new method for manufacturing PMMA and PMMA-based composite is developed especially for such applications. The Linear characteristics of the materials manufactured by different methods were measured by a single beam UV-VIS spectrophotometer, **Non -linear characteristics of PMMA manufactured by pressing and cooling** were measured by the Z-Scan technique developed by Bahee. The results were compared with published results with different manufacturing techniques of PMMA and PMMA-based composite with different kinds of reinforcement, the effect of manufacturing methods on the carbon bonds and particles distribution which affect optical characteristics were also discussed. The research ends with conclusions and recommendations related to the selection of the manufacturing process to obtain specific structures with linear and non-linear optical characteristics.

Keywords: linear, nonlinear, PMMA, composite, manufacturing, optical properties

1. Dr. Eng. consultant in materials sciences & materials applications, Egypt.

The protective effect of Garlic against chromosomal aberrations induced by Azithromycin drug in male albino rats

Shaimaa Mohammed Ali Jasim [1]

Abstract

Garlic plant as therapeutic agent against several common diseases or a culinary spice. It has four main components [allicin, alliin, diallyl sulfide(DAS) and S-allyl cysteine (SAC)], and garlic has a broad range of biological activities including antioxidant, anti-inflammatory, antidiabetic and anticancer activities. The aim of the present study was to identify the toxic effect of Azithromycin drug as well as the protective role of Garlic in some Cytogenetic test (Chromosome aberration). Thus, fourteen mature male albino rats (*Rattus norvegicus*) were used in this study about (2.5 – 3) months aged, and the average weight about (148 – 280) gram in the animal house of Faculty of Science University of Kufa for the period from October 2020 to November 2020. The study indicates numerical and structural alterations in chromosomes after oral administration of animals with doses equal to 500 mg/kg of Azithromycin and 480 mg/kg of garlic were estimated after two weeks. a significant increase in chromosomal aberration rate was noticed in group received Azithromycin and Azithromycin + garlic compared with control who received distilled water and garlic. In addition, the findings indicated a significant decrease in chromosomal aberration rate was noticed in group received Azithromycin +garlic compared with group who received Azithromycin only.

Key words: Azithromycin, Genotoxicity, Garlic, chromosomal aberration and cytotoxicity.

1. Biology department, Faculty of science, University of Kufa, Iraq

Synthesis, Characterization and Theoretical Studiesof Transition metal complex polymeric chain assemblies with mixed azo-carboxylate bridges

Noora Saad Mubder*, Israa Hmood Ibraheem*, Esraa Amer Kadhim*, Suha Nasser Fadhel*, Haider Al-Neshmi**[1]

Abstract

This paper describes the synthesis of a bidentate ligand called bis(N-carboxylatomethyl)-4,4'-dipyridinium, which can form polymeric structures when complexed with metal ions. (L). The reaction was carried out in acetone and refluxed for 72 h, and then HCl was removed by adding Ag_2O to precipitate the chloride ion as AgCl. The ligands behave as zwitter ions; $^{+}2$ from the dipyridyl and -2 from the dicarboxylate ions.

Key words: Synthesi, Theoretical Studies,Azido-Carboxylato ,Metal Complexes, .

1. Department of Chemistery Colleg of Science for Women Baghdad University Military Hospital Al-Hussein

Bio-generation of Ag nanoparticles using green chemistry for enhanced antioxidant and Antiviral Activities

Marwah M. N. AL-Kanan and Iman A. J. Al-Timimi[1]

Abstract

Inorganic metal Ag nanoparticles (NPs) have recently received great attention owing to their biological and biomedical applications. Despite the availability of influenza remedies, the high tendency for the influenza virus to mutate can lead to the emergence of drug-resistant strains. Plant A. annua /ext has the added advantage of generating Ag NPs an influenza remedy. Here, spherical Ag NPs were green synthesized using brown fresh *Artemisia annua* flowers extract in water as a reducing and a capping agent, and as a medicinal plant. The antioxidant and antiviral activities of biosynthesized Ag NPs were investigated. The results obtained showed that Ag NPs can be biosynthesized at room temperature using the reductive/chelating surfaces of the plant extract. The surface morphology of Ag NPs was characterized by TEM, EDX, FTIR, UV-Vis, DLS and XRD. The average size of Ag NPs is ~12 nm. The maximum activity result of DPPH scavenging was determined as 77% at a concentration of 97.02 ug/mL. The biocompatibility of the Ag NPs was greatly improved with no cytotoxic effect observed. The Ag NPs/ *Artemisia annua* flowers extract exhibited 72% neuraminidase inhibitory activity against influenza virus which improved with increased concentration (Ag NPs IC_{50} is 15.97 ±0.91). As a result, Ag NPs could be used as nanomedicine with enhanced antioxidant, antihaemolytic and antiviral properties. These findings show that Ag/A.ext could be a potential candidate for future pharmaceutical application, specifically in treating diseases.

Keywords: Green chemistry, Ag NPs, antihaemolytic, antioxidant, antiviral activities**.**

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1. Department of Chemistry, College of Science, University of Basrah, Basrah, Iraq

Surface Modification of Multi-Walled Carbon Nanotubes by Chemical Treatment and their Characterization

Huda S. Ezzat, Rawaa A. Faris[1]

Abstract

carbon nanotubes are widely utilized for optical, electronic, and mechanical devices as a result of their unique quantum and structural characteristics. Even though different acid treatments and applications of these CNT have been reported, relatively few research studies have focused on the relationship between the acid treatment and the formation of nano defects, specific oxidized species or CNT surface defects. In this work, multiwall carbon nanotube (MWCNT) oxidation at 60 °C was characterized in order to determine the acid treatment effect on the surface. The functionalized multiwall carbon nanotube were identified and quantified by infrared spectroscopy and X-ray spectroscopy. Also, field emission electron microscopy observations showed not only modifications of the oxidized species, but also morphological damage on the surfaces of MWCNT after being exposed to the acid treatment. The acid treatment produced higher oxidized species, decreasing the zeta potential.

Keywords: MWCNT, acid functionalization, ultrasonic bath, characterization

1. Institute of Laser for Postgraduate Studies, University of Baghdad, Baghdad, Iraq

Multiwalled Carbon Nanotube Surface Modification and their Characterization by Chemical-assisted.

Huda S. Ezzat[1], Rawaa A. Faris[2]

Abstract

Multi-functionalized multiwalled carbon nanotubes (MWCNTs) were functionalized in this study using an innovative three-step oxidation method assisted by ultrasonication. We decided on an oxidation system that uses concentrated sulfuric acid, potassium permanganate, and hydrogen peroxide as the three oxidation agents. Using Fourier transform infrared spectroscopy and X-ray photoelectron spectroscopy, the impact of our ultrasound-assisted technique on the carboxyl and hydroxyl content of MWCNTs was compared to non-ultrasonic processes. The outcomes demonstrated that the non-ultrasonic oxidation method is significantly more efficient than the ultrasonication technique. The oxidation of multiwall carbon nanotubes (MWCNT) at 60 °C was studied in this work. The functionalized multiwall carbon nanotube was located using infrared and X-ray spectroscopy, and its size was calculated. The acid treatment's increased production of oxidized species reduced the zeta potential.

Keywords: Acid functionalization, Characterization, Ultrasonic bath, Multiwalled Carbon Nanotubes.

1. Institute of Laser for Postgraduate Studies, University of Baghdad, Baghdad, Iraq
*ORCID ID: https:/orcid.org/0000-0002-1012-6614
2. Institute of Laser for Postgraduate Studies, University of Baghdad, Baghdad, Iraq
*ORCID ID: https:/orcid.org/0000-0002-1012-6614

Lab On-a-Chip-Based an integrated microfluidic device: Low cost, Rapid, and sensitive Analysis of Augmentin

Huda S. Ezzat, Rawaa A. Faris, Mustafa Taha[1]

Abstract

Microfluidic devices present unique advantages for developing efficient drug assay and screening. The microfluidic platforms might offer a more rapid and cost-effective alternative. Fluids are confined in devices with a significant dimension on the micrometer scale. Due to this extreme confinement, the volumes used for drug assays are tiny (milliliters to femtoliters).

In this research, a microfluidic chip consisting of micro-channels carved on substrate materials built using an Acrylic (Polymethyl Methacrylate, PMMA) chip was designed using a Carbon Dioxide (CO_2) laser machine. The CO_2 parameters influence the chip's width, depth, and roughness. To have a regular channel surface, and low roughness, the laser power (60 W), with scanning speed (250 m/s), allows us to obtain microchannels with a minimum diameter of width (450 µm), depth of the channels was 89.4 µm and(Arithmetic Average Roughness Ra = 2.3), (Relative roughness, Ɛ = 5%) surface roughness with high accuracy and good surface quality.

The functionalized multiwalled carbon nanotubes (F-MWCNTs) were used to enhance the drug signal to detect very tiny Augmentin concentrations. In this work, laser microfluidic sensors have high accuracy in Augmentin detection compared to the traditional method(UV-VIS) spectrophotometer with LOD equal to 250 nM, 1µM respectively.

Keywords: microfluidic chip; syringe pump; acrylic; Augmentin; diode laser(532m).

1. Institute of Laser for Postgraduate Studies, University of Baghdad, Baghdad, Iraq

Study of the Resonance Energy Transfer of Two Fluorinated Dyes and Improvement of their Properties Using Nanoscale Gold

Asmahan Asaad Muhmood[1*], liwaa Hussein Mahdi[2], , Inass Abdulah Zgair[3], Shaymaa Awad Kadhim[4], Hayder Hamza Hussain[5]

Abstract

in this work, A two fluorinated dyes (Methyl Orange and Rhodamine 6G) individually and mixed with concentrations ($3*10^{-5}$ ML) as active laser medium was prepared to study the resonance transfer of energy between the two dyes before and after Au NPs addition. Gold nanoparticles were prepared by a chemical reduction method using gold chloride (0.01 M) with sodium citrate and added at different volumetric concentrations (2.5,5, and 7.5%) for each prepared sample. The optical properties (absorption, transmittance, reflectance, absorption coefficient, linear refractive index, attenuation coefficient, optical conductivity) and spectral properties (fluorescence intensity, fluorescence life time, radiation life time, quantum yield, and stoke shift) of the samples prepared, individually and mixed before and after addition were studied using a UV-visible spectrophotometer and fluorescence spectrophotometer in the range (200-800 nm). The phenomenon of fluorescence energy transfer between laser dyes was studied. The two dyes were mixed with a concentration (the best tested one) of ($1*10^{-5}$) ML and a volume concentration of (1:1), and the gold nanoparticles were added at a volume concentration of (2.5,5,7.5) %. An increase was noticed in the intensity of the emission spectrum (fluorescence spectrum) after adding gold nanoparticles.

Key words: gold nanoparticles, Rhodamine 6G, Methyl Orange, fluorescence energy transfer.

1. Kufa University, faculty of science, Physics department.
2. Kufa University, faculty of medicine, pathology branch
3. Kufa University, faculty of science, Physics department.
4. Kufa University, faculty of science, Physics department.
5. Kufa University, faculty of science, Physics department.

Computational Study of the Characterizes, Spectroscopy and Medical Activity of Ruthenium (II) Metal Complex $[Ru(bpy)_2(H_2saltsc)]^+$

Asmahan Asaad Muhmood[1], Ibtisam Jaafar Abd Ali[2], Faeq A. AL-Temimei[3], Ali Kadhim Alsaedi[4]

Abstract

In this search, a ruthenium (II) metal complex [Ru(bpy)2(H2saltsc)]+(bpy= 2,2'-bipyridine) (2saltsc=salicylaldehyde thiosemicarbazone) was carried out using the Gaussian 09 package of programs by employing the B3LYP /DFT method with different basis sets. The results showed that the geometric properties, UV.vis, infrared and Raman spectra a good agreement with experimental data. The ruthenium metal complex was closed shell, and the average energy gap was 0.7392 eV, this value make the ruthenium metal complex has applications lie in the semiconductors region. In addition, the smaller Egap is a sign of the biological reactivity of the complex. The spin density and molecular electrostatic potential surfaces distribution were plotting to obtain influence of ligands on the electronic properties, molecular polarizability and dipole moment of ruthenium metal complex. That the results showed the ruthenium metal complex has high ability to interact with other species or molecules such as DNA.

Keywords: Ruthenium metal complex, DFT, Basis sets, Frontier molecular orbitals.

1. Kufa University, Faculty of science, Department of Physics, Iraq
2. Kufa University, Faculty of science, Department of Physics, Iraq
3. Kufa University, Faculty of science, Department of Physics, Iraq
4. Kufa University, Faculty of science, Department of Physics, Iraq

Preparation of Chitosan coated Ag/Zn nanocomposite by pulse laser ablation and their cytotoxic effects as antimicrobial

Anwar Abdel Razzaq[1], Amer Al-Nafiey[2] *, Ali Al-Marzoqi[3]

Abstract

Chitosan-Ag-Zn nanocomposites have been produced cheaply and are environmentally friendly. Using an Nd-YAG laser with a wavelength of 1064 nm, 300 mJ/constant, 1000 pulses for a silver plate and 500 mJ/Ras with the same wavelength for a zinc plate, as well as pulsed laser ablation in liquids. Ag-Zn nanoparticles are demonstrated by FTIR, TEM, XRD and UV-vis absorption. *Klebsiella pneumoniae* bacteria were successfully inhibited by the generated nanocomposites.

Key words: Chitosan Cs, Silver Ag NPs nanoparticles. Zn nanoparticles, Pulsed laser ablation in PLAL fluids Nano compound. *Klebsiella pneumoniae*, Inhibition. Minimum killing rate

1. Babylon University, Collage of Science for Woman, Iraq
2. Babylon University, Collage of Science for Woman, Iraq
3. Babylon University, Collage of Science for Woman, Iraq

A study of the Incident Rate of colon cancer in districts of Najaf Governorate, Iraq: Risk Estimation

Shaymaa Awad Kadhim[1], Suhad H.Mohsen[2], Hawraa Hashim Abbas[3],Furqan A. Tawil[4], Qassim Shamkhi al khafaji[5],Ban Hussein Ali[6]

Abstract

. In this study, data were collected from the statistical records of the Middle Euphrates Cancer Center on colon cancer patients in the period from 2016 to 2021 for some districts of Najaf Governorate and according to age groups (MECC), the total number of colon cancer cases in the period from 2016 to 2021,for districts (middle Al-Madina, Al-Kufa Al-Razawi, Al-Mishkhab,Al-Haydariyyah,Al-Mundhirah, Al-Hirah) (194) throughout the years.As for the highest percentage for the year (2021), it amounted to 22%, and the data was processed using the chi-square test, as the correlation did not include statistical significance because the probability value was greater than 0.05. The highest rate of narcolepsy was (4.420215) for the age group (39-69), and the lowest was (1.021816) confusion for the age group (46-76).The value of the percentage change was positive (+64.28571), meaning that there was an increase in cases for the years studied, and it can be said that the study was the basis for colon cancer, specifically this region,Najaf, Iraq, and the results were good under the available conditions.

Keyword: Colon, Najaf, Incident Rate , Cancer,MECC

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1. Department of Physics /Faculty of Science/ University of Kufa /Iraq
2. Department of Physics /Faculty of Science/ University of Kufa /Iraq
3. Ministry of Education/Directorate general of education in holly Karbala/Iraq
4. Department of Physics /Faculty of Science/ University of Kufa /Iraq
5. Department of Physics /Faculty of Science/ University of Kufa /Iraq
6. Department of Physics /Faculty of Science/ University of Kufa /Iraq

Effect of nanoparticles on antibiotics concentration in the nasal mucosa in the female rats

Habeeb Shuhaib Ahmed[1], Afyaa Sabah Nasir[2] and Basim Al-Qargholi[3]

Abstract

Nowadays, silver nanoparticles have become crucial for biomedical purposes because of their overall anti-microbial potential effects. In this work, antibiotics, with and without silver nanoparticles, have been used in the nasal mucosa of rats. Nine rates were divided into three groups. The first group received oral amoxicillin/clavulanic acid at 80 mg/kg. The second group received oral amoxicillin/clavulanic acid at a dose of 80 mg/kg combined with silver nanoparticles at 50 mg/kg. The last group, as a control group, received distilled water and a standard diet for one month. At the end of the experiment, the rats were sacrificed, and tissues were removed from the nasal cavity.

The results demonstrated that the silver nanoparticles conjugated with amoxicillin/clavulanic acid increased their distribution in the mucosa of the nasal cavity. The experimental results were evaluated using histological examination via scanning electron microscope. This investigational outcome is essential for many clinical studies of silver nanoparticles and their medical uses in otorhinolaryngology.

Keywords: silver nanoparticles, amoxicillin, nasal cavity, histological examination, scanning electron microscope.

1. Faculty of medicine/ university of Kufa/ Iraq
2. Faculty of science/ university of Kufa/ Iraq
3. Medical instrumentation techniques/Najaf technical institute Al-furat al-awsat technical university/ Iraq

A pathochemical study for evaluation effect of amylase level in type 2 diabetes mellitus patients

MSC. Nour.R.Ali[1], Dr. Adeeb Abdulally Abdulhussien[2], MSC. Zainab M. farhan[3]

Abstract

Objectives: A metabolic condition called diabetes mellitus is characterized by unusually high blood glucose levels (hyperglycemia). Defects in insulin secretion, action, or both are the likely culprits. Uncontrolled diabetes mellitus patients are reported to have glucose intolerance because they are unable to transfer glucose into their fat and muscle cells. Polyuria (excessive urination), polydipsia (excessive thirst), polyphagia (excessive eating), and weight loss are the typical signs of diabetes. A malfunctioning insulino-acinar-ductal-incretion gut hormonal axis occurs from the loss of the continuous interstitial matrix connection between the endocrine and the exocrine pancreas in type 2 Diabetes mellitus in both animal models and people.

goals of the research: This research was done to assess the amylase activity in people with type 2 diabetes.

Keywords: type 2 diabetes, amylase, endocrine metabolic disorders, pancreas.

1. College of Health and Medical Technologies ,National University of Science and Technology, Thi-Qar, Iraq.
2. M.B.Ch.B,M.Sc pathology, Ph.D pathology Collage of medicin Al-Ayen University.
3. College of Health and Medical Technologies ,National University of Science and Technology, Thi-Qar, Iraq.

Synergic Antibacterial Activity of Carbon Nanotubes

Alaa Abdu-Al-Hussain Abdu Al-aon[1], Souzan Eassa[2], Falah Hasan Hussein[3]

Abstract

Carbon nanotubes (CNTs) in their different types have lately been recognized as promising biomaterials for a wide range of biomedical applications, however, the method of synthesizing CNTs are very effective in these types of applications. Biomedical applications need pure CNTs that are free from metals and other impurities. Most synthesizing methods include using of different types of catalysts which are mostly composed of different metals. The synthesized CNTs need to be purified very well before being used in biomedical applications.

In the present study, CNTs were synthesized by flame fragments deposition (FFD) technique and used to measure the antibacterial activity of CNTs against pathogenic bacteria, including Methicillin-resistant Staphylococcus aureus (MRSA) and Pseudomonas aeruginosa has been tested by modified discs diffusion method on Muller Hinton agar.

The results demonstrated that carbon nanotube has antibacterial activity against both bacteria species, S. aureus showed sensitivity for CNTs greater than P. aeruginosa. On the other hand, the antibacterial activity of CNTs was influenced by the concentration, the biggest diameter of the inhibition zone has been documented with a concentration of 400 µg/ml regardless of the bacterial species.

This research presents a costeffective and alternative method for synthesizing CNTs and opening new horizons for the CNTS application as synergistic antibacterial activity, especially against bacteria that has resistant to antibiotics.

1. College of Pharmacy, University of Babylon, IRAQ
2. School of Medicine, University of Kurdistan Hewler
3. College of Pharmacy, University of Babylon, IRAQ

Anatomical characteristics of *Leucaena leucocephala* (lam.) De.Wit growing in Iraq

Noor Mahmmoud Naji* and Nidaa Adnan Abu-Serag[1]

Abstract

Leucaena leucocephala (Lam.)De.Wit is cultivated in Iraq as an ornamental plant .In this paper anatomical characters of different parts of *Leucaena leucocephala* were studied in details ,the study included the characteristics of the epidermal cells ,as the anticlinal walls and the distribution of stomatal complexes of the leaflet ,stem, calyx and corolla .The ornamentation of cuticle as well as the internal structure of the stem ,pulvinus ,petiole ,leaflet and fruit were described , different types of crystals also present .It was found that most characters have a good taxonomic value as a diagnostic characters for this species.

Keywords: *Leucaena leucocephala* ,Transverse section, Micromorphological Characteristics, anatomical characteristics

1. Department of Biology, College of Science, University of Babylon, Iraq

Magnetic Iron Oxides@Prussian Blue Nanocomposites as Bilirubin Scavenger from Plasma of Sickle Cell Anemia of Iraqi Patients

Zainab Ali Hadi[1*] ; Atheer Hameid Odda[2]; Fadhil Jawad Al-Tu'uma[3] and Ammar Fadhil Jawad[4]

Abstract

Background: Blood purification refers to the extracorporeal therapies of removing potentially toxic substances, in which blood is circulated through an adsorption system loading separation materials. Nevertheless, high-efficient inexpensive separation materials are critical to success. Although blood purification mechanisms can remove the excess bilirubin from the human body, still patients with liver failure suffer from hyperbilirubinemia.

Objective: The presented work aimed to strategically designed and synthesized a highly efficient nano-magnetic bilirubin removal system based on iron oxides@prussian blue nanocomposites (Fe_3O_4@PB) NCs.

Materials and Methods: The synthesized nanocomposites have been identified using advanced characteristic techniques, TEM, SEM, XRD, DLS, and Zeta potential. The as-prepared Fe_3O_4@PB NCs. not only have a good magneton effect but also demonstrate dramatic absorbent property that enables to use of an eco-friendly adsorbent nanoagent for the detoxification of toxins.

Results: The **Iron Oxides@Prussian Blue Nanocomposites** exhibited high-performance of bilirubin adsorptions in both serum and blood of sickle cell anemia patients under concern conditions of (Temp. 37.7 ºC, the dose of adsorbent was 1 mg/mL, incubation time 30 min, and initial concentration: 0.25 mg/mL). The results

1. **Department of Chemistry and Biochemistry, College of Medicine, University of Kerbala / Kerbala - Iraq.**
2. **Department of Chemistry and Biochemistry, College of Medicine, University of Kerbala / Kerbala - Iraq.**
3. **Department of Chemistry and Biochemistry, College of Medicine, University of Kerbala / Kerbala - Iraq.**
4. **Department of Pharmacognosy, College of Pharmacy, University of Kerbala / Kerbala – Iraq.**

*Corresponding Author: Zainab Ali Hadi

demonstrated an ideal adsorption capacity of (86%) which is significant as compared to the reported adsorbents.

Conclusion: These results pave the way for the design of other magnetic-based nanomaterials for the selective purification of toxins from human body fluids.

Keywords: Sickle cell anemia, magnetic nanocomposites, bilirubin, scavenger, blood purification

Association between Nesfatin-1 Levels and C-Peptide in Sera of Obese / Non-Obese Type 2 Diabetic Women

Israa Khalil Ibrahim Al-Yassiri[1*] ; Fadhil Jawad Al-Tu'ma[2]; Maher Abbood Mukheef[3],hosay Baqir Jawad[4] and Baraa Abdul-Kareem Mutar[5]

Abstract

Background: Type 2 diabetes mellitus is one of metabolic disorders; it is caused by a combination of two basic factors: insufficient insulin secretion by pancreatic β-cells or a failure of insulin-sensitive tissues to respond adequately to insulin. Nesfatin-1 is secreted from the hypothalamic nuclei and is responsible for controlling appetite and affects many functions such as regulatory effects on energy metabolism through suppression of food intake. In addition it regulates cardiac functions, decreases blood glucose levels, acts as a neuroendocrine regulator, and causes weight loss along with reduction in energy intake.

Objective: The aim of the presented word was to assess the diagnostic accuracy of serum Nesfatin-1 in type 2 diabetes mellitus and its relationship with C-peptide level in obese and non-obese type-2 diabetic women of Iraqi population.

Materials and Methods: A case-control study was performed on 50 type 2 diabetic patients admitted in Al-Hussein Teaching Hospital and Al-Hassan center of diabetes and endocrinology unit / Kerbala health directorate – Iraq and another 50 control individuals, during the period from April, 2022 – Jan. 2023). The T2DM groups were divided into

1. Department of Chemistry and Biochemistry, College of Medicine, University of Kerbala / Kerbala – Iraq.
2. Department of Chemistry and Biochemistry, College of Medicine, University of Kerbala / Kerbala – Iraq.
3. Department of Chemistry and Biochemistry, College of Medicine, University of Kerbala / Kerbala – Iraq.
4. Endocrinologist, Al-Hassan Center of Diabetes and Endocrinology Unit, Al-Hussein Medical City / Kerbala Health Directorate – Iraq
*Corresponding Author:
Israa Khalil Ibrahim Al-Yasiri, Department of Chemistry and Biochemistry, College of Medicine, University of Kerbala.
5. Department of Chemistry and Biochemistry, College of Medicine, University of Kerbala / Kerbala – Iraq.

two groups 25 obese and 25 non-obese; also the control group was divided into 25 obese and 25 non-obese as apparently healthy groups. The ELISA Kit was used to measure serum Nesfatin-1 and C-peptide, and random serum glucose was measured by enzymatic colorimetric method, and lipid profile test were measured through spectrophotometric technique, instead of HbA1c% was determined using HPLC method.

<u>Results:</u> The results observed indicated that Nesfatin-1 levels shown a non-significant decrease in all of type 2 diabetic groups as compared with apparently healthy control group, while the C-peptide were significantly decreased in type 2 diabetic patients when compared with apparently control group. In addition, the random blood glucose and HbA1c% were shown significant elevation in type 2 diabetic patients as compared with apparently healthy control groups. The observed data indicated that Nesfatin-1 and C-peptide levels when comparing between type 2 diabetic patients and control in obese groups shown a risk factors depending upon the odd ratio observed (OR = 1.064 (1.011-1.119), 1.0200 (0.992-1.08)) respectively, but only Nesfatin-1 was shown to be significant. In BMI the levels of Nesfatin-1 and C-peptide, as shown the Nesfatin-1 was significant in obese groups, while the C-peptide as shown significant in normal weight groups. The optimal diagnostic points for Nesfatin-1 were (sensitivity = 98%, specificity = 90%) at a level (Cut-off points) = 39.13, while C-Peptide levels: (sensitivity = 98%, specificity = 94%) at a level (Cut-off points) = 15.99. Both markers have p-values of the AUC were <0.001 and statistically significant.

Conclusion:

1. Nesfatin-1 levels which was non-significantly decreased in non-obese type 2 diabetic patients, while the level of C-peptide was significantly decreased to in non-obese type 2 diabetic patients.
2. The Nesfatin-1 levels was significantly decreased in obese type 2 diabetic patients, while, the C-peptide was non-significantly decreased in obese type 2 diabetic patients.

Nesfatin-1 appears to be able to contribute to the treatment of obesity and diabetes because of its anorexigenic and antihyperglycemic effects. In addition, C-peptide is a known biomarker of insulin resistance and beta-cell function. High specificity and sensitivity analyzed results were obtained by ROC analysis for both markers in T2DM.

Keywords: Nesfatin-1, C-Peptide, Obese, T2DM, BMI, antihyperglycemic

Effect of Caesium-137 and Drought stress on some biochemical characteristics of some varieties of rice varieties

Ahsan A. Kadhimi*

Abstract

Two rice varieties MRQ 74 and MR269 irradiated gamma-ray (Caesium-137) 350 GY, in at Malaysian Nuclear Agency. Effects of Irradiation and drought stress on some physiological and biochemical characteristics were investigated in two rice varieties MRQ 74 and MR269 differing in drought-tolerance ability (Oryza sativa L). through seeds were inoculated into half strength MS medium supplemented with 0.000, 10.000 or 20.000% polyethylene glycol 6000 (PEG). The effect of polyethylen glycol % (PEG) was examined on root lengths Shoot, dry weights, plant fresh, carbohydrate, proline and concentrations. The results showed that there were differences between rice varieties; genotype MR269 produced (non-irradiated) the highest mean plant fresh, weight and carbohydrate content. While genotype MRQ74 (non-irradiated) exhibited the highest proline content compared with genotype MR269. The PEG caused decreasing in means of all characters studied with increasing PEG concentrations, except the means of proline content. The interaction between varieties, gamma ray and PEG concentrations had a significant effect on all the measured traits. Due to the importance of rice in world, it's important to improve these drought sensitive varieties, for drought tolerance using different Mutation and tissue culture techniques. Further research on improvement of drought-tolerant varieties under different drought conditions is essential in order to enhance rice productivity and food security.

Keywords Caesium-137 , Drought stress, Polyethylene glycol , Rice

The sub-chronic toxicity of lead ACETATE IN rabbits: a study of the effect of oral dose and the potential therapeutic role of Zingiber officinale (ZO).

Mohammed Abdulabbas Hasan[1,2,3], Fatima M. Nehme[4], Tabarek A. Khalaf[5], Fatimah H. Razzaq[6]

Abstract

For the past many decades, lead acetate is recognized as a toxic heavy metal that negatively affects the different organs and systems in the body, thereby compromising their functioning. In this study, the researchers determined the histopathological changes that were induced in the rabbit liver due to lead acetate toxicity. They also studied the beneficial influence of ginger in abating adverse effects of lead acetate. Ginger is regarded as an effective source of numerous antioxidants. The researchers administered oral ginger extracts to the experimental animals, for decreasing the lead acetate toxicity (Pb). In this study, the researchers categorized 30 rabbits, randomly into 3 groups (n = 10). Group (A) animals were used as a control and administered distilled drinking water. The rabbits in 2nd (B) and 3rd (C) groups were orally administered two percent Pb solution. However, the rabbits in Group (C) were also administered ginger extracts (100 mg/kg/rabbit) in addition to lead acetate solution for the complete duration of the study. The animal study outcomes revealed that Pb triggered significant pathological changes in the livers of the experimental animals. Some of these histopathological changes included inflammation, vacuolation, fibrosis, degeneration, a valuable decrease in the plasma SOD and CAT enzymatic activities and an increased concentration of plasma malondialdehyde. The researchers aimed to decrease these histopathological changes using ginger extracts. Based on the results, the present trial concluded that ginger considerably reduced the detrimental effects of Pb on the liver. Furthermore, ginger also displayed a prophylactic activity against the Pb-induced hepatopathy.

Key words: Lead acetate, Hepatopathy, Ginger, SOD.

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1. **2,3&5**Department of Biology Science, College of Education for Women, Thi-Qar University, Thi-Qar, Republic of Iraq; bDepartment of Radiology, College of Health and Medical Technology, Al-Ayen University, Republic of Iraq; cDepartment of Pathology and Microbiology, Faculty of Veterinary Medicine, Universiti Putra Malaysia, Serdang, Malaysia.

Some properties and applications of nanoparticles

Ibtihaj Ahmed Kadhim[1], Mohammed Abdulabbas Hasan[2], Azhar Saeed Mohammed[3]

Abstract

The study aimed to keep abreast of developments and developments in all areas of life and benefit from the great scientific and technological developments. Perhaps one of the advanced sciences that depends on linking technology with other sciences (nano science) because it represents a common ground between the sciences of engineering, physics and chemistry and the use of elements These areas in building accurate and applied sciences with a new vision, and they represent a quantum leap in nano sciences and other related sciences. The idea of nanotechnology arose by controlling the size of the atoms of the material in terms of separating and assembling them in different shapes, and thus nanotechnology was able to manufacture machines, tools and materials with a thickness of nanometers.

Key word: Nanotechnology , Nano Meter, Nanomaterial applications .

1. Department of Biology Science, College of Education for Women, Thi-Qar University, Thi-Qar, Republic of Iraq; (2) Department of Radiology, College of Health and Medical Technology, Al-Ayen University, Republic of Iraq; (2) Department of Pathology and Microbiology, Faculty of Veterinary Medicine, Universiti Putra Malaysia, Serdang, Malaysia
2. Department of Biology Science, College of Education for Women, Thi-Qar University, Thi-Qar, Republic of Iraq; (2) Department of Radiology, College of Health and Medical Technology, Al-Ayen University, Republic of Iraq; (2) Department of Pathology and Microbiology, Faculty of Veterinary Medicine, Universiti Putra Malaysia, Serdang, Malaysia
3. Al-Shatrah General Hospital ,Thi -Qar Health Department , Ministry of Health

Determination of the Concentration of Uranium in the Blood Sample of Cancer Patients

Zainab A. Rasheed1a) [1], Adie D. Salman1,b), Eman Ibrahim Awad2,c)[2]

Abstract

The uranium concentration was determined in some cancer patients in the Karbala governorate using the solid-state nuclear pathway detector (CR-39). In this study, blood was obtained from two groups of samples cancer patients (50) and healthy samples (10) (as a control). The highest percentage of uranium recorded in cancer patients was 2.165 ppb, while the lowest was 0.172 ppb. The uranium content of the healthy group ranged from 0.104ppb to 0.614ppb. With a significant value ($p< 0.001$), the evaluation showed that the percentage of uranium in cancer patients was greater than in the control group, indicating that the concentration of uranium played a role in cancer. Finally, the "uranium" concentration in blood samples was found to be less than the UNSCEAR and WHO allowed limit.

Keywords: uranium, concentration of uranium, cancer, CR-39

1. Department of physics, college of science, university of Kerbala 56001, Karbala, Iraq
2. Department of physics, college of Applied medical science, university of Kerbala 56001, Karbala, Iraq

Antibacterial of CuO Nanoparticles Prepare in Pulsed Laser Ablation Method

Ali J. Khalaf[1], Narimann Neamah Hussein[2], Taghreed N.Jamil[3], Kais Khudhair AL hadrawi[4]

Abstract

This study investigated the effect of different solvents (ethanol, acetone, and distilled water) on the preparation of CuO nanoparticles by laser ablation in liquid. The results showed that the solvents had a significant impact on the optical properties, surface morphology, and antibacterial activity of the CuO nanoparticles. The highest absorption was observed at 231, 237, and 217 nm for the CuO nanoparticles prepared in ethanol, acetone, and distilled water, respectively. The particle size of the nanoparticles also varied depending on the solvent used, with the average size being 91.35 nm in ethanol, 47.9 nm in acetone, and 77.57 nm in distilled water. The antibacterial activity of the CuO nanoparticles was also affected by the solvent used, with the inhibition diameters of Gram-negative *Escherichia. coli* and Gram-positive *Staphylococci*. *aurous* being the largest for the nanoparticles prepared in ethanol and the smallest for those prepared in distilled water.

Key-Words: nanoparticle, Pulsed laser ablation, CuO nanoparticles , optical properties.

1. Radiology Techniques Department, College of Medical Technology, The Islamic University, Najaf, Iraq
2. Radiology Techniques Department, College of Medical Technology, The Islamic University, Najaf, Iraq
3. Radiology Techniques Department, College of Medical Technology, The Islamic University, Najaf, Iraq
4. Radiology Techniques Department, College of Medical Technology, The Islamic University, Najaf, Iraq

Effect Potash alum on the Efficiency of the Solar Cell

Ali J.Khalaf, Taghreed N.Jamil, Narimann Neamah Hussein[1]

Abstract

Potash alum has a clear effect on the efficiency of the solar cell
The concentrations prepared are (5,6,7), whereby increasing the concentration of potash alum, an increase in efficiency is observed, meaning that the relationship is directly proportional between the increase in concentration and efficiency. The amount of original efficiency before using potash alum was (18.05), after using potash alum it increased to (29.54) at the concentration (7mol/l).

Keywords: Potash alum, Nonmaterial's, Device, Stokes Shift, wavelength.

1. Radiligy techniques Departmant, College of Medical Technology, The Islamic University, Najaf, IRAQ

A Numerical study to improve the thermal properties of Transformer Oil-Based Nanofluids

Mohammed Kh. Abbas[1], Fares A. Hatem[2], Nazar Aldabash[3], Ali Kh. Ali[4]

Abstract

The development of contemporary insulating liquid materials is influenced by several determinants, such as stringent criteria for electrical insulation and other safety and economic considerations. Therefore, transformer manufacturers have to design transformers with these new specific requirements. The transformer oil-based Nanofluids with improved dielectric and thermal properties have the potential to replace mineral oil-based products on the market. They are favorable because they function better than mineral oil and contribute definite insulating and thermal gains. The electrical transformer's efficiency rises and its lifespan is increased when certain properties of the transformer oil are improved. In this study, certain nanoparticles will be added to the oil to increase certain properties rather than utilizing pure transformer oil for cooling and insulating. The study will focus on two axes: the first is to create a hybrid Nanofluids ($CuO+Al_2O_3+TiO_2$+Oil) with a variety of concentrations (0.2%, 0.4%, 0.6% w/v), and the second is to create a Nanofluids (Fe_3O_4+Oil) with varied similar concentrations. The results demonstrated that using Nanofluids (Fe_3O_4) increases thermal conductivity and dielectric efficiency, cooling the transformer and improving its efficiency. The best results were obtained at a concentration of 0.6% w/v. The dielectric directly increases with the addition of a mixture of Nanofluids (CuO, Al_2O_3, and TiO_2), with only a little impact on the other characteristics.

Keyword: Nanofluids, thermal conductivity, Transformer Oil, dielectric

1. Department of Mechanical Engineering, University of Diyala, Diyala, Iraq, 32001
2. Ministry of Education, General Directorate of Education of Diyala, 32001
3. Department of Mechanical Engineering, University of Diyala, Diyala, Iraq, 32001
4. Department of Mechanical Engineering, University of Diyala, Diyala, Iraq, 32001

Preparation, spectroscopic properties, and application of silver nanoparticles from plant extract

Farah M. Ibrahim[1], Shaymaa MA Mahmood[2], Huda Ghalib Salman [3]

Abstract

One of the most important applications of metal nanoparticles is their role in solving the problems of environmental pollution issues that affect human health. Therefore the green preparation of these particles at the lowest cost to remove heavy metal ions is the main goal of our research. The green preparation of silver (Ag) nanoparticles using bioactive extract (olive leaf) were done. Diagnosis of silver (Ag) nanoparticles was measured using FTIR, UV-vis., XRD, AFM and FESEM. FTIR spectra showed an interaction between the hydroxyl group of the extracting plant and the silver nitrate solution. The surface Plasmon resonance band at 420 nm proves silver nanoparticles' production from UV-vis analysis. The XRD showed an average size equal to 34.19 nm for Ag nanoparticles. The roughness average=0.946nm with an average height=9.951 nm from AFM images. The energy dispersive X-ray analysis has proven sliver nanoparticles' formation through element composition, the weight Ag%=65.7, and the sharp silver and plant extract peaks appeared. Ag nanoparticles showed a high removal% of Cd^{2+} ions, which acts as an adsorbent agent to decrease water contamination. In addition, silver nanoparticles exhibit antibacterial inhibition for Staphylococcus aureus and Escherichia coli.

Keywords: green preparation; silver nanoparticles; plant extract; adsorber nanoparticles; heavy metal ions; antibacterial inhibition.

1. Department of Chemistry, College of Science, Al-Nahrain University, Jadriya, Baghdad, Iraq
2. Department of Chemical engineering, College of Engineering, Al-Nahrain University, Jadriya, Baghdad, Iraq
3. Department of Chemistry, College of Science, Al-Nahrain University, Jadriya, Baghdad, Iraq

3rd International Conference on Researches in Nanotechnology & Nanoscience A reduction of the half-wave voltage for Lithium Niobate electro-optic Mach-Zehnder modulator

Sadeq A. Habeeb[1]

Abstract

In this research, it proposes theoretically model to controlling on half-wave voltage of modulator in order to improving the performance of electro-optic modulation, in which it uses studying the factor of effective refractive index difference Δn_{eff}, this using analysis distribution of refractive index for LN material before and after voltage is applied (i.e., with and without applied voltage), and uses analysis a factor of propagation constant difference $\Delta\beta$, before and after voltage is applied where it depends on the wavelength, these leads to it controls on the half-wave voltage $V\pi$ using a reduction half-wave voltage up to 1V. Also, it achieves better performance of electro-optic modulator by it finds excellent solution for analysis the fundamental optical mode with effective refractive index $n_{eff.}$ Finally, it achieves lower applied voltage up to 10-20 V,

KEYWORD: Pockel-effect, Lithium niobate material LN, Push-Pull drive, MZI modulator, Electro- optic effect

1. University of Diyala, College of engineering , Department of communications, Iraq

Effect of *Hibiscus rosa-sinensis* Flowers Nanoparticles on some Reproductive Hormonals of Male Albino Rats

Faris Naji A. Alhady[1], Samer Habib Kareem[2], and Adnan Mansour[3]

Abstract

Background: The growing rats of population in world's has a detrimental influence on the environment and economic growth, Numerous plant extracts have been discovered to be effective as contraceptives by decreasing male and female fertility. **Aim and objectives:** this study aimed to investigate the effect of ethanolic extract of *Hibiscus rosa* sinensis flower carried on nanoparticles on some hormones level. **Animals and methods:** twenty male albino rats were divided into five groups: G1 (-ve control): treated with tap water (0.2 ml / day), G2 (+ve control): treated with nanoparticles (300mg empty liposome / day), G3: treated with flower extract nanoparticles (100mg/kg/day), G4: treated with flower extract nanoparticles (200mg/kg/day), and last group G5: treated with flower extract nanoparticles (300mg/kg / day). Hormonal assay (LH, FSH, and Estrogen and Testosterone level). Immunological biomarkers assay were done (IL-6 and TNF-α level). **Results:** The results showed that increasing the dose leads to significant decrease ($p<0.05$) in the level of Testosterone, LH and FSH in groups treated of extract with nanoparticles compared with control groups while there is significant increase ($p>0.05$) in the level of Estrogen in groups G4 and G5 treated of extract with nanoparticles compared with G3 and control groups. Also the results showed significant decrease ($p<0.05$) in the level of IL-6 and TNF-α in groups treated of extract with nanoparticles compared with control groups. **Conclusion:** One of these plants is the

1. College of Science, University of Babylon, Iraq.
2. College of Science, University of Babylon, Iraq.
3. College of Veterinary Medicine, Al-Qasim Green University, IRAQ.

Corresponding author:
Faris Naji A. Alhady, University of Babylon, College Science, Iraq. Phone No.: (+964) 7718399942.

Authors' contributions:
All authors participated the study design, conceptualization, motivation, writing-original review, and editing manuscript. All authors had performed the experiments, collected and analyzed the data, drafted the manuscript, and confirmed the authenticity of all the raw data. All authors read and approved the final manuscript.

powdered blossoms of the plant *Hibiscus rosa*-sinensis L. which possesses fertility-inhibiting effects, as the results of our current study showed that dosing with extract of *Hibiscus rosa* flowers loaded nanoparticles for 55 days leads to beneficial results.

Keywords: Hibiscus; Extract; hormone; Nanoparticles; immune.

The role of lipoprotein-associated phospholipase A2 (LP-PLA2) with lipids in myocardial infarction disease

Zainab Hazem Mohammed[1] , Thikra Ali Allwsh * [2]

Abstract

Introduction: A myocardial infarction (MI), sometimes referred to as a heart attack, is a disorder that damages the blood vessels that supply the heart muscle. An obstruction in one of the blood arteries that supplies the heart is the primary cause of the vast majority of heart attacks. Plaque can accumulate inside the arteries, burst, and form a blood clot that becomes lodged in the artery. this can deprive the heart muscle of blood and cause a heart attack.

Lp-PLA2 is a clinically significant human enzyme and a marker of inflammation used to evaluate risk factors for cardiovascular illnesses. In human plasma, it is connected to both low- and high-density lipoproteins.

Objective: Lp-PLA2 is a therapeutic target in vascular disease prevention so, We investigated the association of Lp-PLA2 activity with risk of coronary heart disease.

Methods: The study included measurement LP-PLA2 level and some biochemical variable levels in (80) samples of myocardial infarction patients with age (35-75) are collected from cardiac care unit of Ibn Sina Teaching Hospital in Mosul, Iraq under the supervision of doctors, and the control group including (80) sample of healthy people with no history of disease and age-matched for the patient group.

Results: The results revealed a significant increase in the level of Lp-pLA2 increased in myocardial infarction patients compared to the control group. Also, it has been found that was a significant increase in the levels of Triglycerides, low-density lipoprotein-cholesterol, very low-density lipoprotein-cholesterol, total cholesterol, and Non-HDL, In addition to a decline in high-density lipoprotein cholesterol.

There is also a significant correlation between Lp-pLA2 and lipoprotein, cholesterol

Conclusion: The study concluded that Lp-PLA2 is a biomarker of

1. Department of chemistry, College of Education for Girls, University of Mosul, Mosul, Iraq
2. Department of Chemistry, Collage of Science, University of Mosul, Mosul, Iraq

inflammation and it is an independent risk factor for myocardial infarction higher level of LP-PLA2 activity further increases the risk of cardiovascular events.

Keywords: Lipoprotein-associated phospholipase A2 , myocardial infarction , Triglycerides ,
HDL, Total cholesterol.

Polymeric nanoparticles for efficient drug delivery system

Sama J. Al-zuwaini[1*], Faramarz Mehrnejad1[2], Yasaman Mahmoodi[3], Ali Hossein Rezayan[4], Mohammad Barshan-tashnizi1[5]

Abstract

The enzyme L-asparaginase is widely used as complementary chemotherapy and an enzymatic drug to treat many diseases. However, as a medication, L-asparaginase also faces difficulties because of the inherent nature of proteins. As a result, various natural and synthetic polymers are used to create biodegradable nanospheres and microspheres for drug delivery and release. In this study, the effect of poly (lactic acid) (PLA) on the structure and dynamics of L-asparaginase was studied using molecular dynamics (MD) simulations. The results showed that the secondary and tertiary structures of the protein in the presence of the polymer did not change during the simulation time and even increased the stability of the structure and decreased the protein dynamics. This study showed that lysine and arginine actively interact with the PLA polymers. Several hydrophobic and polar amino acids interact with the polymer and the enzyme. The results showed that the main binding forces of PLA polymer to L-asparaginase are electrostatic and van der Waals interactions. The findings of this study can provide useful information to clarify some of the ambiguities in the experimental results for the encapsulation of the enzyme L-asparaginase and its use in the pharmaceutical industry.

Keywords: L-asparaginase; Encapsulation; PLA; Molecular dynamics simulation; Self-assembly.

1. College of Science for Women, University of Babylon, Iraq.
2. Department of Life Science Engineering, Faculty of New Sciences and Technology, University of Tehran, Tehran, Iran.
3. Department of Life Science Engineering, Faculty of New Sciences and Technology, University of Tehran, Tehran, Iran.
4. Department of Life Science Engineering, Faculty of New Sciences and Technology, University of Tehran, Tehran, Iran.
5. Department of Life Science Engineering, Faculty of New Sciences and Technology, University of Tehran, Tehran, Iran.

Theoretical Description for Optoelectronic Properties of Small Compounds as Organic Solar Cell Applications

Hussein K. Mejbel[1] and Lafy F. Al-Badry[2]

Abstract

Recently, organic solar cells become attracted the attention of many researchers owing to flexibility, low cost, light weight and large-area applications, and significant improvement in the power conversion efficiency. In this work, we designed chains from organic compounds as donors, we replaced the core unit in each series by variety acceptors in order to enhance their optical and electronic characterization and performance for power conversion efficiencies in organic solar cells. We utilized density functional theory (DFT) method at the B3LYP/ 3-21G level and time dependent density functional theory (TD-DFT) to investigate the geometry optimization by using the Gaussian 09 program. Both electronic and optical properties were determined, which involve the lowest unoccupied molecular orbital (LUMO), the highest occupied molecular orbital (HOMO) levels, the band gap energy, maximum absorption wavelength (λ_{max}), open circuit voltage (V_{oc}) and light harvesting efficiency (LHE). Our evaluation denote that the small compounds suggested are predicted to exhibit best performances with compare to the first series (SC1) like a lower band gap energy, a least HOMO energy level, a greater absorption range and a larger power conversion efficiency (PCE).

Keywords: HOMO; LUMO; Organic solar cells; Small molecules; Power conversion efficiency.

1. Department of Physics, College of Education for Pure Science, University of Thi-Qar, Nassiriya 64001, Iraq
2. Department of Physics, College of Science, University of Thi-Qar, Nassiriya 64001, Iraq

The influence of Nickel acetate Ni(ch_3Co_2)$_2$ concentrations on the optical properties of compound (Zinc oxide, Aluminum oxide) based on Epoxy resin.

Ahmad J.H. Almaliky[1]*, Nadhim A. Abdullah[2], Ibrahim K. Ibrahim[3], Hussein F Hussein[a], and Khalid I. Ajeel. [4]

Abstract

Composite thin films are intentionally manufactured media that typically consist of two or three phases, one of which is metallic and the other dielectric. The word "thin films" denotes that it's about composites with a little amount of metal phase. It has been demonstrated in this study the influence of nickel acetate with various ratios (0%, 0.5% ,2% ,5%, 10 %, 12.5 %) on the optical properties of zinc oxide/ aluminum oxide compound based on epoxy resin. The optical characteristics of such as absorption (A), transmission (T), absorption coefficient (α), optical energy gap (Eg) and other optical constant such as refractive index, extinction coefficient, real and imaginary parts of dielectric constant have been investigated. The optical energy gap has been estimated to be 3.39 eV to 2.81 eV.

Key word: Optical characteristics, epoxy resin, zinc oxide, aluminum oxide, nickel acetate, absorption, transition, dielectric constant.

1. Department of physics, College of Education for Pure Sciences, University of Basrah, Basrah, Iraq.
2. Department of Material Science, Polymer Research Centre, University of Basrah, Basra, Iraq
3. Department of Chemistry and Polymer Technology, Polymer Research Center, University of Basrah, Basra, Iraq.
4. Department of physics, College of Education for Pure Sciences, University of Basrah, Basrah, Iraq.

Study the effect of microwave radiation on some carboxylic acids containing the hydroxyl group in the alpha site

Muhammed khidir Muhammed[1]

Abstract

The effect of microwave radiation on three carboxylic acids were studied (2-hydroxypropanoic acid, 2-hydroxy-2-methylbutanoic acid, 2-hydroxy-2-phenylpropanoic acid) in solid state and at different times. It was found that the effect of microwave radiation on these acids using energy between (75%-50%) of total machine energy which is equal (900 w) and for 2-3 minutes. Leads to dehydration of the carboxylic acid, through suggested mechanism of free radical reaction, and its changing to ester and then to polyester. The results were identified by UV-Vis spectrophotometer and FTIR spectrophotometer and ^{1}H-NMR spectra (Bruker 400MHz spectrometer) measurements in addition to qualitative chemical test.

Keywords: Carboxylic acid, Microwave radiation, 2-hydroxypropanic acid, 2-hydroxy-2-methylbutanoic acid, 2-hydroxy-2-phenylpropanoic acid.

1. Ministry of environment, Department of protection and improvement of environment, northern region, Kirkuk, Iraq.

Comparative assessment of the fate and toxicity of chemically and biologically synthesized silver nanoparticles to juvenile clams

Dr. Amar Yasser Jassim (Al-rshim) [1]

Abstract

Nanoparticles (NPs) can be produced via physical, chemical, or biological approaches. Yet, the impact of the synthesis approaches on the environmental fate and effects of NPs is poorly understood. Here, we synthesized AgNPs through chemical and biological approaches (cit-AgNPs and bio-AgNPs), characterized their properties, and toxicities relative to commercially available Ag nanopowder (np-AgNPs) to the clam *Mercenaria mercenaria*. The chemical synthesis is based on the reduction of ionic silver using sodium borohydride as a reducing agent and trisodium citrate as a capping agent. The biological synthesis is based on the reduction of ionic silver using biomolecules extracted from an atoxigenic strain of a filamentous fungus *Aspergillus parasiticus*. The properties of AgNPs were determined using UV-vis, dynamic light scattering, laser Doppler electrophoresis, (single particle)-inductively coupled plasma-atomic mass spectroscopy, transmission electron microscopy, and asymmetric flow-field flow fractionation. Both chemical and biological synthesis approaches generated spherical AgNPs. The chemical synthesis produced AgNPs with narrower size distributions than those generated through biological synthesis. The polydispersity of bio-AgNPs decreased with increases in cell free extract (CFE):Ag ratios. The magnitude of the zeta potential of the cit-AgNPs was higher than those of bio-AgNPs. All AgNPs formed aggregates in the test media *i.e.*, natural seawater. Based on the same total Ag concentrations, all AgNPs were less toxic than $AgNO_3$. The toxicity of AgNPs toward the juvenile clam, *Mercenaria mercenaria,* decreased following the order np-AgNPs > cit- AgNPs > bio-AgNPs. Expressed as a function of dissolved Ag concentrations, the toxicity of Ag decreased following

1. Department of Marine Vertebrates, Marine Science Center, University of Basrah, Iraq.
Center for Environmental Nanoscience and Risk, Department of Environmental Health Sciences, Arnold School of Public Health, University of South Carolina, Columbia, SC, 29223, USA.

the order cit-AgNPs > bio-AgNPs > $AgNO_3$ ~ np-AgNPs. Therefore, the toxicity of AgNP suspensions can be attributed to a combined effect of dissolved particulate forms. These results indicate AgNP synthesis methods determine their environmental and biological behaviors and should be considered for a more comprehensive environmental risk assessment of AgNPs.

Evaluation of removal torque values of commercial pure Titanium and Zirconium implants coated with Faujasite in rabbit

Ahmed Ali Mohammed , Thekra Ismael Hamad

Abstract

Background: one of the improvements of osteointegration bone implant contact by surface alteration through coated implants with Faujasite, it is aluminosilicate material, microporous, and has antibacterial behavior. Objective: the goal of this study to compare the mechanical property (removal torque) of both implants material after coated with 7% Faujasite at 2 and 6 weeks in rabbits' femur.

Material and Methods: the coating was done by using electrospinning method, 10 implants for each experimental and control groups to the both intended materials that implanted in healthy rabbits' femur and measure removal torque after 2 and 6 weeks of healing time.

Results: the coated implants had greater removal torque values than uncoated groups, in 2 weeks the coated Titanium greater value in removal torque than zirconia, but in 6 weeks the valued of removal torque with coated Zirconia became greater than in Titanium.

Conclusion: we can conclude that coated of dental implant with Faujasite was better osteointegration than uncoated groups.

KEYWORDS: Osteointegration, topography, Microporous, Electrospinning

Sequencing of the *sea* gene amplicon of thirty *Staphylococcus aureus* isolated from beef samples

Sura I. A. Jabuk[1], Eman M. Jarallah[2]

Abstract

Staphylococcus aureus ability to secreted heat-stable toxins. Consumption of food contamination with staphylococcus toxins (SEs) leads to symptom of disease. Five hundred beef samples were collected from the butchers and markets to isolate the *S.aureus* . The PCR method was used to investigate the present sea toxin gene . The result found the prevalence of *S.aureus* isolates was 30(100%). One genetic locus covering a portion of the *sea* (staphylococcal enterotoxin type A) gene was amplified in this study. For the PCR amplicons observed in the amplified genetic locus, a direct sequencing strategy was used. It was then determined that the observed variants had an accurate phylogenetic distance from each other, as well as relative bacterial sequence. Our results showed 99 percent homology between our samples and *S. aureus* species. Sequencing results showed the presence of only one variant occurred in thirteen out of thirty investigated samples (G44C) with a missense effect (Tyr136Arg) on the endotoxin type A protein. Due to the observed G44C nucleic acid substitution, the observed variants and wild type bacterial isolates of investigated samples were positioned in two different phylogenetic positions represented by two distinct positions in the currently generated comprehensive tree. Within one of these positions, all investigated samples with G44C mutations were positioned in a unique phylogenetic group within *S. aureus* sequences. whereas the other investigated wild-type isolates were positioned in the majority of incorporated *S. aureus* sequences in the vicinity of the highly related American and English *S. aureus* species. In conclusion, the present *sea* gene-based tree provided an accurate tool for the discrete ability of such genetic fragment to discriminate between the investigated isolates of *S. aureus*. Therefore, the utilization of *sea* gene-based nucleic acid variation has presented a confirmed ability to efficiently

1. University of Babylon, College of Science, Department of Biology, Babylon, Iraq
2. University of Babylon, College of Science, Department of Biology, Babylon, Iraq

discriminate the investigated *S. aureus* samples into two distinctive phylogenetic clades and showed the pattern of their phylogenetic distribution.

Key Word: *Staphylococcus aureus*, phylogenetic tree, Enterotoxine A, Sequencing.

The effect of liponanocortisone on immunological parameters sach as (gelsolin (GSN) and calprottectin(CALP).) and joint tissues in male rats with arthritis.

Tamadhur Hani Hussein[1] and Alaauldeen S.M.AL-Sallami[2]

Abstract

Nanotechnology in the treatment of diseases is considered one of the prominent techniques for obtaining safe and effective medicines and treatments at the same time. The aim of the research is to know the effect of liponanocortisone in improving arthritis in rats. Fifteen rats were used in this experiment, divided into three groups (five rats per group), the first group was injected with Normal Saline (as a control group), the second group induced arthritis, it was injected with FIA for a week, the third group, after a week elapsed for the development of arthritis, this was injected The group took liponanocortisone for a week as well. The results of the current study showed significant changes in the percentage of gelsolin(GSN) and calprotectin (CALP) concentration in the third group, compared with the control group and the arthritis group. This study revealed that rats with joint pain who develop arthritis show a change in the concentration of proteins of both (GSN) and (CALP) starting with a decrease in (GSN) concentration with an increase in the CALP concentration and infiltration of inflammatory cell to the synonium tissue , that meaning There is an inverse relationship between the low concentration of (GSN) and the infiltration of inflammatory cells into the joint tissue, in addition to a direct relationship between the high (CALP) concentration and the infiltration of those inflammatory cells leading to arthritis.The current study also indicated the efficiency of the therapeutic compound in inhibiting this infiltration of inflammatory cells to the synovium , Thus, it works to return of the percentage of GSN, CALP concentration and then heal the joint.

1. Animal production/ Faculty of Agriculture/ Al-Qasim Green University
2. Department of Department of Biology, Faculty of Science, University of Kufa, Iraq

Microorganisms as New Sources of Energy

Assist. Prof. Dr. Emad Salaam Abood[1]

Abstract

The basic feature of life is oxidoreduction, which creates energy from matter , However, some microorganisms can embed solar energy in very complex mechanisms of production of low-energy compounds from so-called nature pollutants caused by natural pollutants created by the technology of processing oil, sugar cane, and natural oils (harmful technologies). In addition to photosynthesis, some microorganisms, such as cyanobacteria, can decompose water into the desired oxygen and even more desirable hydrogen, and some can directly produce hydrogen via anaerobic processes . Some, in turn, can convert classic environmental pollutants into very highly potent energy compounds (methane, alcohol). Thus, the genotypic and phenotypic traits of many species of microorganisms can direct the production of energy products to more perfect and efficient technologies and environmental purifiers .

1. Assist. Lec. Raghad Ahmed Hussien
Hilla University College , Babylon , Iraq

Effectiveness of medicinal plants extract against pathogenic bacteria to prevent and treatment of urinary tract infections

Suad A Al-Hilu[1] and Wisam H Al-Shujairi [2]

Abstract

Introduction: Urinary tract infections (UTIs) are among the most common infectious diseases in humans caused by the presence of microorganisms, UTIs are often not treated with broad-spectrum antibiotics due to they contribute to the development of a resistant microorganism. Therefore, the study aimed is to study the antibacterial efficacy of some medicinal plants for the treatment of urinary tract infection. **Methodology:** A 100 samples were collected from patients ranging in age from 10 to 60 years, with UTIs. Out and inpatients having UTIs, living in Al-Najaf center and attending treatment at A-Hakeem hospital and Al-Sader Teaching Hospital. Ten microliter of urine sample were inoculated on selective media for isolation and identification of pathogenic bacteria and presumptive identify was finally identification by Viteck-2 system. Ten antibiotics were used for showed antibiotic susceptibility Ciprofloxacin (CIP, 10 µg), Streptomycin (S, 25 µg), Amoxillin (A, 30 µg), Erythromycin (E, 10 µg), Azithromycin (AZM, 15 µg), Cefixime (CFM, 5 µg), Gentamicin (CN, 10 µg), Nitrofurantoin (NIF, 50 µg). Two species of plants were used for revealed antibacterial activity: *Castanea crenata* and *Saussurea costus*. **Results:** From one hundred urine samples only eighty tested positive for significant bacteriuria. *Escherichia coli* was the most prevalent bacteria in urine 50(62.5%), followed by *Klebsiella pneumonia* 10(12.5%), *Proteus vulgaris* 7(8.75%), *Pseudomonas aeruginosa* 6(7.5), *Staphylococcus aureus* 4(5%), and *Streptococcus pyogenes* 3(3.75%). Gram-negative bacteria include *E. coli*, *Klebsiella*, *Pseudomonas*, and *Proteus*, which are resistant to many drugs and are increasingly resistant to most available antibiotics. *Castanea crenata* and *Saussurea costus* inhibited the growth of

1. Department of Biology/Faculty of Sciences, University of Kufa, 54001 Najaf, Iraq
2. Department of Clinical Laboratory Sciences/College of Pharmacy, University of Babylon, 51001 Hilla, Iraq

pathogenic bacteria isolated from urine samples. **Conclusion:** testing and finding out the antimicrobial activities of medicinal plants will help pharmaceutical companies to develop modifiers or precursors for the synthesis of new therapeutic alternatives drugs used to treat infectious diseases caused by pathogens.

Study of Carcinogenesis in adult women in Hilla city

Ruqaya Munther J.Ewadh[1]

Abstract

Cancer is the leading cause of death among women worldwide, in both high-income and middle-income countries. Cancer is becoming more prevalent in countries of all income levels as the population increases and ages. As population rises, cancer risk factors such as obesity, early menarche, and smoking, as well as environmental contamination and low or late birth rates, become more prevalent. This study included fifty women with various types of cancer. The work was done at Babylon Medical City Hospital. Questionnaires were used to collect information on data such as a woman's age, cancer, marital status, feminine education, social activity of women, such as smoking, hormone treatment, and cancer history. Data was collected and statistically analyzed. The differences were statistically significant at ($p < 0.05$).It is concluded that there is a strong correlation between cancer and the risk factors among most of the parameters used.

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1. University of Babylon- Iraq \College of Pharmcy.

Clinical Study for the Spexin levels and its relationship with glucose metabolism and immune function in obese postmenopausal women with type 2 diabetes mellitus and without obese.

Aqeel Akheit Khayoon[1], Royaa Biabanikhankahdani[2] and Ali B. Roomi[3*]

Abstract

Background: It has been suggested that Spexin plays an important role in the metabolism of energy through multiple pathways, which significantly leads to obesity and metabolism. The research of this study is the role of Spexin in obesity and without obesity for women with type 2 diabetes after menopause.

Methods: The comprehensive study recruited 150 women divided into three groups: G1 (50 women suffering from diabetes with obesity after age) and also G2 (50obese women suffering from obesity and diabetes), as well as the control group, all in menopause. Demographic criteria were BMI and age, with or, where all women were over 50 years of age with a diagnosis of insulin level, HOMA-IR, HbA1c, FBG, SPX, CRP, IL-6, and lipids. Samples were taken from Al-Hussein Teaching Hospital in Dhi Qar, southern Iraq, as well as from the Endocrine Center.

Result: The results showed a significant decrease ($P<0.001$) in the serum levels of Spexin in the G1 and G2 groups compared to the control group. It plays an important role in obesity, as measured by the body mass index (BMI) of G1 patients G2, and control groups which showed a significant increase ($P< 0.001$), Insulin show a significant increase in G1 compared to the levels of the control group ($P \leq 0.001$) as well as G2, as well HOMA-IR a significant increase (0.001) when comparing G1 with the control group, while there are no statistically significant differences p.Value(0.72) or a significant increase between

1. Islamic Azad University Shiraz Branch, College of Science and Agriculture,
2. Islamic Azad University Shiraz Branch, College of Science and Agriculture,.
3. University of Thi-Qar, Thi-Qar, 64001, Iraq.
Department of Medical Laboratory, College of Health and Medical Technology, National University of Science and Technology, Thi-Qar, 64001, Iraq.
Corresponding author: Ali B. Roomi

G2 when compared with the control group, The results showed a significant ($P< 0.001$) increase in (FBG ,HbA1C) in groups G1 ,G2 compared to the control group. While as shown in the Table-2 Parameters (lipids) are Cholesterol(TC),Triglyceride(TG),Low-density lipoprotein(C-LDL) and High-density lipoprotein(C-HDL) showed a significant increase ($P< 0.001$) in the two groups G1, G2 compared to the control group except a significant decrease in the levels of good cholesterol for the levels of the first group G1 compared with the control group P.Value 0.001 , while there are no significant differences in the levels of G2 (1.14±0.10mmol/l) compared with the control group P.Value 0.43.Then the immunological parameters appeared (Interlukin-6 (IL-6), High sensitivity C-reactive protein (CRP) in the table-3 showed a relatively significant increase in IL-6 compared between G1 and the control group P value of (0.01) while there are no statistically significant differences P 0.77 between when compared with the control group. The correlation showed that the SPX significantly a negative correlation with all study's parameters except IL-6 that showed a positive correlation P value (0.05).

Keywords: Spexin, Diabetes, TIIDM, menopause, obesity, immunity.

The relationship between the Spexin levels and the glucose metabolism in obese postmenopausal women with type 2 diabetes mellitus

Aqeel Akheit Khayoon [1*], Roya Biabanikhankahdani[2*] and Ali B. Roomi[3]

Abstract

Background: It is suggested that spexin is the newest newly discovered member of the family of peptides believed to be composed of 14 amino acids that are expressed by neurons in the hypothalamus, which control the coordination of energy balance, reproduction and obesity. It has an important role in energy metabolism through multiple pathways in obesity and reproduction. The study on this topic is the role of spexin in obese women with TIIDM after menopause.

Methods: The comprehensive study recruited 100 women divided into two groups: G1 (50 women suffering from diabetes with obesity after age) and also as well as the control group, all in menopause. Demographic criteria were BMI and age, with or, where all women were over 50 years of age with a diagnosis of insulin level, HOMA-IR, HbA1c, FBG, SPX, CRP, IL-6, and lipids. Samples were taken from Al-Hussein Teaching Hospital in Dhi Qar, southern Iraq, as well as from the Endocrine Center.

Result: The results showed a significant decrease ($P<0.001$) in the serum levels of Spexin in the G1 group compared to the control group. It plays an important role in obesity, as measured by the body mass index (BMI) of G1 patients and control groups which showed a significant increase ($P< 0.001$) Insulin show a significant increase in G1 compared to the levels of the control group ($P \leq 0.001$) as well HOMA-IR a significant increase (0.001) when comparing G1 with the control group The results showed a significant ($P< 0.001$) increase in

1. Islamic Azad University Shiraz Branch, College of Sciences, Agriculture and Modern Technologies
2. Islamic Azad University Shiraz Branch, College of Sciences, Agriculture and Modern Technologies
3. University of Thi-Qar, Thi-Qar, 64001, Iraq.
Department of Medical Laboratory, College of Health and Medical Technology,
, National University of Science and Technology, Thi-Qar, 64001, Iraq.
Corresponding author: Roya Biabanikhankahdani

(FBG ,HbA1C) in group G1 compared to the control group. While as shown in the Table-1 Parameters (lipids) are Cholesterol(TC), Triglyceride(TG), Low-density lipoprotein(C-LDL) and High-density lipoprotein(C-HDL) showed a significant increase ($P< 0.001$) in the groups G1, compared to the control group except a significant decrease in the levels of good cholesterol for the levels of the first group G1 compared with the control group P.Value 0.001 , Then the immunological parameters appeared (Interlukin-6 (IL-6), High sensitivity C-reactive protein (CRP) in the table-3 showed a relatively significant increase in IL-6 compared between G1 and the control group P value of (0.01) The correlation showed that the SPX significantly a negative correlation with all study's parameters except IL-6 that showed a positive correlation P value (0.05).

Keywords: Spexin, Diabetes, TIIDM, menopause, obesity, immunity.

Continuum Model on (FXTD) of Fungal Growth

Education College for Pure Sciences, Wasit University, Iraq

Nabaa Naeem, Prof.Dr.Ali Hussein Shuaa

Abstract

In principle, we know that the growth of any plant requires time, effort, and cost that differs from one plant to another, as well as fungus. In this paper, we studied its growth behavior and the effect of each branch on the fungus, then we combined a number of branches represented as mathematical model as partial differential equations (PDEs), approximate numerical solutions, and some mathematical steps, such as non-dimensionalisation, finding stability or steady state and representing it on phase plane, we found approximate results for these types using certain codes in **MATLAB** such as **Pplane8** and **Pdepe** .

Keyword: Lateral tip-hypha, anastomosis and Hyphal, Fungal Growth, Mathematical Model, Tip-hypha anostomosis.

Mathematical Model of FYTHD Branching Type With Hyphal Death

Tamadhir jafaar kadhim Al_Dahan[1] , Prof.Dr.Ali Hussein Shuaa Al_Taie[2]

Abstract

The teaching of models in biology is what gave rise to this study. to address challenges they are acquainted with a fresh perspective, to mentally generate a precise model, to translate it into mathematical words. This paper about mathematical model show behavior for growth of Lateral branching, Dichotomous branching, Tip death , Tip-hypha anastomosis with Haphal death . Despite the fact that there is an error ratio, mathematical modeling often decreases the amount of effort, time, and money needed to get the intended outcome. With the aid of a solution to a system of partial equations (PDEs), we will study the mathematical model of branching. The conclusions will show whether the tested fungus species grew successfully or not and in the numerical analysis, we applied a few symbols (pplane8, Pdepe).

1. College of Education for Pure Sciences || Wasit University || Wasit || Iraq || 52001 ||
2. College of Education for Pure Sciences || Wasit University || Wasit || Iraq || 52001 ||

Extraction Nano-partials Zinc Powder from Industrial Waste by Selective Leaching

Sami I. Jafar Al-rubaiey* , , Firas F. Sayyid *and Marwa F. Abd*[1]

Abstract

High purity zinc powder was obtained using selective leaching of industrial brass waste in basic, acidic and neutral solutions. The free immersion method without voltage and the method of applying voltage using linear polarization method were used. The immersion method was characterized by a change in the color of the sample when the zinc was removed from yellow to red spots indicating the removal of zinc and the appearance of copper in the red spots. The anodic linear polarization curves were characterized by the appearance of three active regions, the first in which the removal of zinc occurs through the dissolution of both the zinc and copper together, and the second region, which is a stable state characterized by the appearance of oxides of both zinc and copper on the surface of the samples. As for the third region, which is the stage of zinc removal with the dissolution of zinc only. The results showed that acid solutions give the largest quantities of powder with a purity of 98%, followed by neutral solutions with a purity of 96%, then the basic solutions with a purity of 94%.

Key Words; Brass-alloy, industrial waste, **free immersion** ,Selective leaching, Dezincification corrosion, Linear polarization , passive, and Purity.   .

1. University of Technology Dept. Production Eng.& Metallurgy.

Electrochemical Behaviors and Corrosion Properties of Bourdon Canned Meat

Ali Kamel Muhammad, Jamal Manea Al-Rubaiey& Sami Ibrahim Al-Rubaiey*[1]

Abstract

Canned foods are exposed to presented cases of damages, therefore, they are to be classified as invalid for human consumption, especially those preserved in metal cans. The metal cans are predisposed to corrosion when the factors of corrosion are present. To begin with, corrosion represents a chemical or electrochemical reactions between the metal (can) and the medium that represents the food for what it contains- a lot of ions and chemical agents that activate corrosion processes. This requires, in practice, careful monitoring of corrosion, adherence to the specified age of can, and not consuming canned products that have exceeded their expiration period, or whose cans have been subjected to cases of mechanical shocks, scratches or cracks. Such defects accelerate corrosion.

The present work deals with the study of the electrochemical factors that help the appearance of corrosion in dry meat. The cans are made of mild steel coated with materials containing polymers and certain proportions of tin. Tin works to provide a longer life than steel, as it has a higher electrochemical potential than steel. Though, care must be taken to prevent the possibilities of scratches or cracks in the protective layer, largely because corrosive ions will penetrate and interact directly with steel in narrow areas to cause localized corrosion. As a result, steel will dissolve into ions that diffuse in the food, contaminating them. When entered into the human body, the contaminated food becomes poisonous and causes deadly diseases.

The current research will study the corrosion and electrochemical behavior of canned meat known commercially as Borden. The chemical composition of both the can and its contents- the meat in this case- was studied by XRD and FTIR. Tafel extrapolations method was used to calculate corrosion rate and to study electrochemical behaviors. The results of the testing show that the can is made of mild

1. University of technology , Baghdad ,Iraq.

steel as a basic element. This steel was coated by protective layering containing tin at a ratio of 0.03% for each face and food polymer. In this research, nanoparticles of tincture were added in different proportions (0.03%, 0.035%, 0.04%, 0.045%, 0.05%) to a food polymer to improve the corrosion resistance of food cans. The best ratio (tin / polymer) which provides the best corrosion protection has been concluded.

Keywords: Electrochemical,Corrosion,Bourdon,Canned meat ,Mild steel,Food polymer, and Tin.

Synthesis Of Nanocomposite Hydrogel For Controllable Drug Delivery System.

Noor Hadi Aysa[1]

Abstract

In this research, polyvinyl alcohol (PVA) was chemically cross-linked using Epichlorohydrin (ECH). The nanocomposite hydrogels containing several metal oxide nanoparticles(MONPs) were synthesized through immersion of polyvinyl alcohol hydrogel in metal oxides solution with different concentrations.

The produced metal ions were bound to hydroxyl groups via metal complexation. With the addition of NaOH solution. The morphology, surface investigation and identification of nanoparticles in polymer matrix were characterized using Fourier transform infrared spectroscopy, X-ray diffraction and scanning electron microscopy. Swelling properties of the prepared nanocomposite hydrogels were investigated with various solutions such as the d-glucose, NaCl salt solutions. Metal oxide nanoparticles led to an increase in swelling capacity of nanocomposite hydrogels. Indeed, loading and release behaviors of ibuprofen on nanocomposite hydrogels were studied.

1. College Of Pharmacy, University Of Babylon , Iraq

Synthesis, characterization, DFT investigation, and antibacterial activity of a new nano-sized binuclear nickel(II) Schiff base complex as a precursor for NiO nanoparticles

Rehab K. Al-Shemary,Ali N. [1]

Abstract

An ultrasonic technique was used to create a hexadentate imine ligand (NNO)2 from the condensation of N-hexyl-3,6-diformylcarbazole, 2-amino-5-chlorobenzaldehyde, and 5-chloro-2-hydroxyaniline. Various physicochemical techniques were employed to explore the symmetric Schiff base ligand H2L and its nickel complex Ni2LCl2 by field-emission scanning electron microscopy (FE-SEM), FT-IR, 1H, and 13C NMR, TGA, mass, and UV/Vis spectroscopy. The named complex was used to make nanoscale nickel oxide particles, evaluated using FT-IR, FE-SEM, and X-ray powder diffraction (XRD) methods. It showed close conformity to the conventional pattern of NiO nanoparticles and a suitable size in the nano range (36 nm). Density functional theory calculations were performed using a double basis set LANL2DZ for nickel and a 6-31+G(d,p) basis set for the remaining atoms at the B3LYP levels of theory. Based on the optimal structures, the ligand and its nickel complex's optimized geometry were determined. The vibrational frequencies of the compounds and their 1H NMR and 13C NMR chemical shifts were measured and compared to experimental results. This comparison revealed good agreement between theoretical and experimental data, which can be significant proof of the accuracy of experimental and analytical data and the validity of the applied mathematical model. The antibacterial activities of the Schiff base ligand and its nickel complex were investigated in vitro against gram-positive (Staphylococcus aureus and Enterococcus faecalis) and gram-negative (Pseudomonas aeruginosa and Escherichia coli) microorganisms.

1. Department of chemistry /college of Education for Pure Science (Ibn Al-Haitham), University of Baghdad, Baghdad, Iraq

Synthesis and Characterization of MoS_2 Nanoparticles by Laser Ablation in Liquid with Polyethylene Glycol (PEG)

Amer Al-Nafiey[1]*, Nagham M. Obaid[1] , Ghaleb Al-Dahash[2]

Abstract

In this study, we fabricated a composite of polyethylene glycol (PEG) with molybdenum disulfide (MoS_2) using the laser ablation method for the first time, with different energy levels of 100, 300, and 500 mJ. The structural, optical, and thermal properties of the composite were investigated using various characterization techniques. The UV-Vis spectra showed a redshift in the absorption edge with the increase in laser energy. The FTIR spectra indicated the presence of functional groups in both PEG and MoS_2, and the characteristic peaks of both components were observed. The refractive index of the composite was found to decrease with an increase in laser energy. TEM images revealed the presence of rod-like and spherical particles with different sizes. The energy gap of the composite was also found to decrease with an increase in laser energy. The high absorption of the composite in the near-visible and visible regions allowed the photodiode to detect light with high sensitivity and accuracy. It is showing that the forward bias current of (2×10^{-3} Amp) is still relatively low and further optimization of the photodiode design and materials could lead to even higher current values and improved performance. These results suggest that the laser energy has a significant effect on the properties of the $PEG\text{-}MoS_2$ composite. The obtained results demonstrate that the $PEG\text{-}MoS_2$ composite has potential applications in various fields, including solar cells and drug delivery systems.

Keywords: Polyethylene glycol, Molybdenum disulfide, Laser ablation, Composite, Refractive index, TEM, Energy gap, Photodiode.

1. Collage of sciences for woman- University of Babylon-Iraq
2. Collage of sciences for woman- University of Babylon-Iraq

Immunological biomarkers Correlation with both age and sex in periodontitis disease

Aysar Ashour Khalaf[1] ;Kaiser Abdulsajjad Mohammed Hussain[2]:Rasha Hadi Saleh[3]

Abstract

Background: Periodontitis is the most common osteolytic disease in humans and the most common cause of tooth loss in adults, The susceptibility of the host can be modified by various systemic factors with age and sex are being one. **Aim of study:**The present work was amied to reported the statistical correlations among the evaluated interleukines with age and sexof th patients .**Methods**: The case-control study included 85 patients and 40 healthy individuals,with (18-67) years old in age.ELISA techniques was followed in orded to determined the levels of immunological markers.**Results**: serum and gingival crevicular fluid concentrations of IL-34 were positively significant correlated with age, the statistical analysis revealed that the mean IL-34 level in serum, and GCF increased in patients of 40 – 54 years old, while, there is no significant differences in the serum and GCF level of MCP-1 based on age progression within the patient group .The MIP-1α result is similar to result of MCP-1, the limitation of small sample size could be attributed to these results in both healthy and periodontitis groups. Furthermore, investigate the concentration of IL-34based on sex, the patients had higher IL-34 levels than healthy. sex had significant effect on IL-34 production. There is no relationship between MCP-1 production and sex, the inflammatory response is unaffected by sex. Same investigation found in the comparison of both serum and GCF MIP-1α levels in both male and female in patient group. **Conclusions**:It can be concluded that interleukins responses can be effected by age and sex due to their different physiological system ,this may be usefull for detecting and predicting clinical outcomes and prognostic factors for periodontitis.

1. Department of biology, college of educational for pure science, university of Kerbala, Kerbala, Iraq.
2. Department of biology, college of educational for pure science, university of Kerbala, Kerbala, Iraq.
3. Department of clinical laboratory sciences, college of pharmacy, university of Babyon, Babylon,Iraq..

Green biosynthesized selenium nanoparticle by using *Bacillus clausii*

hawraa jawad kadhim [1], Wijdan Ridha Taj-Aldin [2]

Abstract

Due to its importance in numerous physiological processes, selenium nanoparticle research has gotten greater interest in recent years. In comparison to selenium, selenium nanoparticles have a high level of absorption in regular supplementation. SeNP has been synthesized using a variety of chemical and biological techniques. Because of its antioxidant, antibacterial, antidiabetic, and anticancer properties, selenium nanoparticles have biological and pharmacological applications . This article reviews biosynthesis of SeNPs using Na_2SeO_3 and *Bacillus clausii* under aerobic conditions.The morphological and structural properties of selenium Nanoparticles were determined by UV- Vis spectroscopy and the absorption peak was observed at (260 nm) wavelength , XRD (18.215 nm) , AFM (19 ± 4 nm) . The antimicrobial and hemolysis activities of selected SeNPs were tested .

1. Department of Biology, College of Science for women , University of Babylon, Hilla ,Iraq
2. Department of Biology, College of Science, University of Babylon, Hilla ,Iraq

Clinical analysis of traumatic thoracic aortic injury: Experience of Four-year series of 9 cases During the ISIS War in Iraq

Noor Abbas Hummadi Fayadh[1], Abbas Jaafar Khaleel Al-Anbari*[2], Bassam Maddah H. Al-Alosi[3]

Abstract

Background

The extremely unusual and lethal traumatic aortic injury brought on by thoracic and abdominal traumas. The mortality rate of trauma patients can be significantly decreased by early detection of acute aortic injury.

The goal of this study was to give a reference for early clinical diagnosis of AAT cases so that mortality might be decreased. We described practical models of early interventions of AAT.

Material and methods

A retrospective study identified ten rescued incidences of AAT among all trauma patients who arrived at our tertiary center. The average age of the group was 34.2 + 10.2 years and 1 of the 10 patients was female. In eight patients, successful surgical intervention and clinical results were attained. Patient demographics, concomitant injuries, thoracic radiography, and CT scan images recorded at the time of admission were all taken from the patient's records. Successful surgical treatment and clinical outcome were achieved in all four patients.

1. Department of Surgery, College of Medicine, Al-Nahrain University, Baghdad, Iraq.
2. Cardiovascular and thoracic surgery, College of Medicine, Al-Nahrain University, Baghdad, (ZIP) 10072, Iraq.
3. Cardiovascular and thoracic surgery, College of Medicine, University of Anbar, Anbar, (ZIP) 31004, Iraq.
*Corresponding Author
Abbas Jaafar Khaleel Al-Anbari, Al-Emamain Al-Kadhymain Medical City, Baghdad, Iraq.

Consequences of pregnancy-induced hypertension: a two-year single-center case series experience

Maysaloon Adnan Abdul Razzak[1]

Abstract

Background

Pre-eclampsia is one of the primary reasons for fetomaternal mortality and morbidity, as well as stillbirth when left untreated. After 20 weeks of gestation, severe preeclampsia, a significant pregnancy sequence, appears and is characterized by raised blood pressure besides protein in the urine. We assessed the maternal and fetal outcomes in pregnancies complicated by preeclampsia in light of the critical advantage of early management of females with preeclampsia and the rising prevalence of these disorders in pregnancy.

Materials and methods

Between 2020 and 2022, research and sample selection for this prospective observational cohort were conducted. All new deliveries (2375) that occurred in Babylon City throughout the research period were included in our data source, and 90 samples were identified as having severe preeclampsia and evaluated. A detailed medical history, physical examination, and pertinent tests like a complete blood count, urine protein test, coagulation profile, and liver function test were used to evaluate all the registered females. The information gathered includes information on the patient's age, gestational age, clinical and laboratory results, birth method, and blood pressure measurements taken at the time of admittance.

Results

Out of the 2375 deliveries that occurred in Babylon during the research year, the average age of the 90 mothers that were enrolled was 25 years old. In 81.1% of instances, prenatal care was routine. 0.41% of women had severe preeclampsia overall. The majority of cases (63%) had late-onset preeclampsia. 10% of females had a family history of hypertension, and 41% of mothers had a history of gestational hypertension. Antepartum hemorrhage (17), Eclampsia, and Abruptio placenta (16% each) were the most common maternal

1. Department of Gyn. & Obst., College of Medicine, Kerbala University, Kerbala, Iraq.

complications, while HELLP syndrome occurred in 9% of mothers. Fetal outcomes were as follow: 79.9% were live birth of them 51.25 are term babies 43.1% were preterm. 36.7% of fetuses were born with respiratory distress syndrome or had IUDs (5%), and 7% delivered stillbirth. 77% of preeclamptic women were terminated with cesarean section.

Conclusion

Although there was one maternal death, still, both maternal and fetal complications of preeclampsia were common. The overall prevalence of severe preeclampsia in the current study was 0.41%. To lessen the condition of uncertainty, and terrified experience, women and their partners require thorough, consistent, and repeated information on severity and prognosis.

Keywords: Preeclampsia, eclampsia, HELLP syndrome; perinatal death, maternal, fetal, complications, early-onset, late-onset, hypertension.

Early and Late Complications in Patients with SARS-2/COVID-19 Viral Infection: Prospective Follow-up Study

Zaman Ibraheem Lafi

Abstract

COVID-19 is an emerging viral infection that recently caused pandemic characterized by acute respiratory distress syndrome. The aim of this study is to evaluate the early and late complications of SARS-2/COVID-19 infection in a subsets of patients admitted to the respiratory care unit in Iraq/Babylon/Merjan Teaching Hospital. Seventy-five patients diagnosed with COVID-19 infection were included in this study, and the results suggested that early complications in about 20% of these patients shown myocarditis/pericarditis, 40% of patients develop hyperglycemia mostly steroid induced, 30% of patients were suffered from recurrent secondary bacterial infections and about 10% of patients develop venous thromboembolism and hypertension. Late complications include; long COVID-19 syndrome, hypertension and pulmonary fibrosis. However, older patients who have existing medical conditions shown serious illness complications from COVID-19 in this study. These medical conditions include; chronic obstructive pulmonary disease (COPD), overweight, smoking, chronic kidney disease, pregnancy, asthma, liver disease, weakened immune system, diabetes, strokes, hypertension, and cancer.

Occupational Hazards and Safety Terms on Nurses at Different Hospitals

Prof. Dr. Samah Ahmed Kadhum[1]

Abstract

Nurses are exposed to various hazards in hospitals, which can affect their health . So this study aimed to identify potential occupational hazards, to assess the risk of adverse health effects related to these hazards and to recommend prevention and control measures to protect them. It is widely acknowledged that nurses are crucial components in the healthcare system. In their roles nurses are regularly confronted with a variety of biological, physical, and chemical hazards during the course of performing their duties. So the Preventive measures must be taken and nurses must comply with all safety instructions to reduce the exposure to these occupational hazards to a minimum.

1. Microbiology PhD. , Department of Clinical Laboratory Sciences/ College of Pharmacy/ University of Babylon, Iraq. Health Security Partners (HSP) Fellow.

Loading Doxorubicin on the surface of metal oxide and using as drug delivery

Asmaa H. Hammadi[1],Saba Abdulmunem Habeeb[2], Fattima Al-Zahra Gabar Gassim[3]

Abstract

Cancer has been around for a while, but it's still one of the most severe illnesses that causes people anxiety for a variety of reasons, including the rapid effects on the body. Its unintentional discovery and the challenges of surviving. The most detrimental are the side effects of anti-cancer drugs, which also include psychological harm and symptoms like general weakness, lack of appetite, hair and head loss, and thinness. However, the advent of nanotechnology revolution that allowed semiconductors to be delivered on drugs provided hope for treating this illness. For instance, TiO_2, which is produced industrially, is a high purity, low toxicity, and environmentally acceptable substance. Producing TiO_2 nanoparticles and adding them to anti-cancer medications at a scale lab are the objectives of this project. After the catalyst had been created utilizing the quick and easy SOL-GEL method, doxorubicin (DOX) was subsequently non-covalently complexed (TiO_2/DOX) or covalently conjugated onto the TiO_2 nanoparticles (TiO_2-DOX).

To study its optical properties, TiO2 is subjected to a variety of techniques, such as XRD characterization, which clarified phases and particles as small as 17.3 nm, SEM characterization, which described the morphology and particle size distribution of TiO2 between 10 and 45 nm, and FT-IR characterization, which looked at functional groups in TiO_2 both before and after drug loading.

1. College of Pharmacy, University of Babylon, Babylon 51001, Iraq
2. College of Pharmacy, University of Babylon, Babylon 51001, Iraq
3. College of Pharmacy, University of Babylon, Babylon 51001, Iraq

Platelet derived growth factor Levels in Plasma Cell Myeloma Patients. Case - Control Research among Iraqis

Hayder Abdul-Amir Makki Al-Hindy[1 *], Ghazi Mohamad Ramadan[2], Amjed H. Abbas[3], Mazin Jaafar Mousa[4], Amir S. Al-Mumin[5]

Abstract

Background: Multiple myeloma (MM) or “plasma cell myeloma”, the second most frequent neoplasm after non-Hodgkin lymphomas, is a cancerous proliferation of plasma cells within the bone marrow. Platelets-derived growth factor (PDGF), a mitogenic cytokine extracted from platelets, is one of the cytokines associated with tumor pathogenesis or progression. This research aimed to compare the values of PDGF in cases with MM to control people.

Material and Method: In the current case - control study, fifty-five cases of MM were identified by a professional hematologist. Patients undergoing treatment were separated into two groups: 26 with stage II and 16 with stage III, while the recently diagnosed cases of MM patients were divided into two groups as well: 6 with stage II and 7 with stage III. Furthermore, 25 healthy adults assisted as controls. The ROC-curve analyses was used to distinguish patients from control people, as well as phases II and III.

Results: The total included subjects had a mean age of 60.1 0.7 years (average 47–78 years). The mean PDGF concentrations in the circulatory system were 687.7 ± 80.6 (average 27.2 – 5634.9). Gender found no substantial differences in the distribution of the variables. Except for the platelet counts, no statistically significant variations were found between the MM and the healthy control in any of the research criteria.

1. College of Pharmacy, University of Babylon, Babylon, Iraq.
2. Ahlulbayt University College, Karbala, Iraq.
3. Hammurabi College of Medicine, University of Babylon, Babylon, Iraq.
* Corresponding Author
Ass. Prof., Medical Physiology, Hilla, Babylon, Iraq.
4. College of Pharmacy, University of Babylon, Babylon, Iraq.
5. Hammurabi College of Medicine, University of Babylon, Babylon, Iraq.
* Corresponding Author
Ass. Prof., Medical Physiology, Hilla, Babylon, Iraq.

To detect MM, PDGF had a reduced accuracy measure (0.424), 95% CI (0.292 - 0.556), P-value >0.05, low sensitivity (0.40), and specificity (0.74). Furthermore, the ROC curve analysis demonstrated that PDGF had a poor ability to discriminate advanced stages of MM patients.

Conclusion: The authors observed high non-significant levels of PDGF in MM cases compared to control subjects. As well, there was the poor capability of PDGF to discriminate MM cases from healthy or advanced from the early stages of the tumor. Nevertheless, further studies are desirable for explaining the significance of PDGF as biomarkers in MM.

Keywords: PDGF, Multiple myeloma, bone marrow neoplasm, plasma cells.

Outcomes of a single-center case series on severe ischemic mitral valve repair with coronary revascularization

Abbas Jaafar Khaleel Al-Anbari[1], Okba Fathi Ahmed[2]

Abstract

Background

As people get older and are referred for coronary artery intervention, more people are presenting with both valve and coronary artery disorders. The purpose of the study is to describe the outcomes of single-center combined coronary artery bypass grafting and ischemic mitral valve repair experience.

Methods

This study was conducted retrospectively in a single center for four years (2016–2020), including 70 patients. It includes every case of MV repair and CABG operating together. The data were obtained from the hospital archive. Approximately two years were spent following up with the patients overall. Thoracic echocardiography and coronary preoperative catheterization were performed on all individuals.

Results

There were 70 cases in the present study, with a mean patient age of 56 years (range from 42 to 78 years), 32 females and 38 men. High blood pressure was the most prevalent comorbidity, present in 24 cases. 22 patients had a single transplant, 31 patients require a 3-vessel graft, and 17 subjects underwent a 2-vessel graft. The cross-clamp period ranged from 40 to 80 minutes, while the CPB time ranged from 120 to 140 minutes, with a mean of 120 minutes. The duration of admission in the intensive care unit extended from 48 to 72 hours, with an average stay of 51 hours. The patients spent a median of 7 days in the hospital (range 5 to 10 days).

1. Consultant of Cardiovascular and Thoracic Surgery, Department of Surgery, College of Medicine, Al-Nahrain University, Iraq.
2. Iraqi Center for Cardiac Surgery, Baghdad, Iraq.
*Corresponding Author
Ass. Prof., Consultant cardiovascular and thoracic surgery.
Orcid: 0000-0003-6048

Conclusion

In patients with severe IMR, mitral valve repair when combined with CABG not linked with a higher perioperative death rate. Concomitant MV Repair surgery decreased the recurrence of severe MR during follow-up, but somewhat it did not lower late mortality

Keywords: CABG, coronary revascularization, ischemic mitral valve repair

Preparation and Study of the Surface Topographical of ZnO Nano- Thin Films By Sol – Gel Method

Maan Abd-Alameer Salih[1], Mohammed Hadi Shinen[2], Q. S. Kareem[3]

Abstract

In this research was to prepare ZnO by sol – gel method and then deposited on the(ITO - glass, Silicon wafer and glass) substrates by spin- coating 2000 rpm and then thermally treated in a furnace heat. Then the samples were examined by X-Ray, as well as UV and then was PMMA deposition at different spin speed by using spincoating (1000, 2000 and 3000) rpm for Nano-thin film (67, 91, 182) nm respectively. Effect of precursor concentration on the structural of the films was investigated. The diffraction patterns of X-ray diffraction (XRD) characterization indicated that all of ZnO thin films were polycrystalline with a hexagonal wurtzite crystal structure. The peaks were indexed to (100), (002),(101)and (102) planes. Intensity of all diffraction peaks increased and became broader in full width at half maximum (FWHM) values with increasing precursor concentration. The Atomic Force microscopy (AFM) images of surface morphology of the films confirmed the results of XRD characterization. The grain size of ZnO thin films decreased as result of increasing temperature. Cross-section of AFM images showed that the temperature of ZnO thin film increases from 152.3 nm to 233.6 nm with increasing precursor concentration. This works shown that morphological and structural of ZnO thin films prepared using sol-gel spin coating methods were strongly influenced by temperature concentration.

Keywords: Zinc oxide (ZnO), sol-gel, PMMA polymer, Nano-thin film

1. physics department, University of Babylon , College of Science .
2. physics department, University of Babylon , College of Science .
3. physics department, University of Qadisiya, College of Education .

Synthesis of Fe_2O_3 and NiO Nanoparticles as Adsorbent Substances to remove Sulfur Compounds from crude Oil

Mostefe Khalid Mohammed and Abdulqadier Hussien Al khazraji[1]

Abstract

The metal oxides nanoparticles (α-Fe_2O_3 and NiO NPs) are synthesized via eco- friendly method. The current study investigates the use of *Capparis spinosa* leaf extracts as a reduction agent for the synthesis of iron and nickels oxides nanoparticles with $FeSO_4.7H_2O$ and $NiSO_4.6H_2O$ salts as precursors. Firstly, we have obtained the $Fe(OH)_2$ and $Ni(OH)_2$ nanoparticles by the addition of sodium hydroxide solution dropwise along with *Capparis spinosa* extracts. The iron and nickels oxides nanoparticles were prepared by calcination the metal hydroxides nanoparticles at 600 ºC for 6 h. The characterization of metal oxides nanoparticles was done using FT-IR, XRD, FE-SEM, EDX, and BET techniques. X-ray diffraction studies showed the particles phase were Orthorhombic and cubic for α-Fe_2O_3 NPs and NiO NPs respectively, estimating the crystallite size at 26.92 nm and 42.89 nm respectively, and was confirmed that the nanoparticles to be iron and nickel oxides. BET analysis gave the surface area and average pore diameter for α-Fe_2O_3 NPs was 20.32 and 3.76 m^2/g, while, NiO NPs was 38.07 nm and 26.88 nm. By EDS analysis constituting iron 64.3% and oxygen 24.6% for α-Fe_2O_3, Nickel 66.8% and oxygen 16.3% for NiO NPs. FE-SEM explain spherical shape of nanoparticles. The application of the nanoparticles as adsorbent tested by attempting to remove the sulfur compounds from crude oil, which was completely achieved in 60 min. The kinetics study of the sulfur compounds removal was also modeled.

1. Department of Chemistry, College of Education for Pure Science, University of Diyala, Iraq

Coccidioidal meningitis

Prof. Dr. Azhar A.F. Al-Attraqchi*[1], Dr. Jabbar S. Hassan[2], Dr. Ameer SH. Hadi[3]

Abstract

We present a case of meningitis caused by *Coccidioidisspp.*in a 64 years old DM patient presented with fever, nausea, vomiting, and change in mental status CSF smear with lactophenol cotton blue, revealed a typical picture of *Coccidioidis* spp. This is a first case reported in Iraq.

Keyword: Coccidioidal meningitis, pleocytosis, Amphotericin B

1. Ph.D College of medicine/Al-Nahrain University/Medical Mycology.
2. Ph.D student/ College of medicine/Al-Nahrain University.
3. Neuromedicine/Baghdad teaching Hospital.

Effect of Yttria Stabilized Zirconia (YSZ) Nano Particles on the Microstructure and Mechanical Properties of AZ31 Fabricated by Powder Metallurgy Technique

Basma Fanner Sultan[1], Muna Khethier Abbass[2], Jawdat Ali Yagoob[3]

Abstract

The AZ31 alloy is one of the most popular magnesium alloys with aluminum and zinc. Due to its low density and good plasticity which have been widely used in airplane, automobile and medical applications. However, AZ31 alloy is kind of hexagonal close packed (HCP) lattice metal, and the limited slip systems leads to the poor mechanical properties. This paper presents the effect of different additions of Yttria Stabilized Zirconia (ZrO_2-Y_2O_3) of 1,2 and 3wt% YSZ Nanoparticles on mechanical properties of AZ31 alloy prepared by powder metallurgy technique . The microstructure and mechanical properties (hardness, compressive strength and diametral tensile strength) of sintered base alloy and nanocomposites were studied. The results indicate that the compressive strength and diametral tensile strength of sintered sample were mainly related to the concentration of the YSZ nanoparticles , where an increase in concentration led to an improvement in strength and increase the hardness. According to the obtained results , the best mechanical properties was for AZ31 base alloy containing 3%YSZ nanoparticles , which hardness value was 81.74 HV , compressive strength and diametral tensile strength values were 110.75 MPa and 5.08 MPa respectively as compared to base alloy 74.45 , 80.25 MPa and 3.76 MPa.

Keywords: AZ31 magnesium alloy, compressive strength, diametral tensile strength, YSZ nanoparticles , powder metallurgy.

1. Department of Production Engineering and Metallurgy, University of Technology, Baghdad-Iraq,
2. Department of Production Engineering and Metallurgy, University of Technology, Baghdad-Iraq,
3. Engineering Technical Collage Kirkuk Northern Technical University, Kirkuk-Iraq

Molecular Diagnosis of *Hymenolepis diminuta* in Human and Rats in Babylon Province /Iraq

Akeel Mohammad Al-Musawi [1], Safaa Mohammed Kareem[2], Haider H.O. Alseady[3], Talib Ahmed Hamid AL-Rubeaye[4], Samer Saleem Hantoosh Alshkarchy[5]

Abstract

A zoonotic tapeworm with a wide range of distribution is called *Hymenolepis diminuta*. The current study's objective was to use molecular technique to detect the parasite in samples taken from human and rats in Babylon province. A total of 60 stool samples from human and 40 fecal samples from rats were collected during the beginning of July 2021 to the end of October and analysed by molecular methods. Molecular description of *H. diminuta* was achieved by gene sequence of internal transcribed spacer 1 (ITS1). The PCR confirmed the identification of the parasite by electrophoresis as well as DNA sequencing. The result showed that the infection rate in human was (5/60) 8.33%, while in rats was (11/40) 27.50%, DNA sequencing detected 5 positive samples of human were *H. diminuta* and 5 positive samples from rats were *H. diminuta.* We conclude from the present results that *H. diminuta* is similar in both rats and human, and thus it is a source of infection for human. We recommended to detect *H. diminuta* in mice as source of zoonotic infection.

Keywords: *Hymenolepis diminuta*; PCR; Human; Rats ; ITS1, Sequence analysis.

1. Department of Parasitology, College of Veterinary Medicine, Al-Qasim Green University, Babylon.
2. Department of Parasitology, College of Veterinary Medicine, Al-Qasim Green University, Babylon.
3. Technical Institute of Babylon, Al-Furat Al-Awsat Technical University (ATU), Iraq.
4. Technical animal production department, AL-Mussaib technical college, AL-Furat Al-Awsat Technical University
5. Department of Parasitology, College of Veterinary Medicine, Al-Qasim Green University, Babylon.

Adding different concentration of paprika dyes (Capsicum annuum L) to tomato paste and studying the qualitative and storage characteristics

Sheren Fadhal Abbas[1], Alia Zyara Hashim[2], Faleeha Hasan Hussein[3], Seyed Hadi Razavi[4], Zahra Emam-Djomeh[5]

Abstract

Although sweet red pepper (*capsicum annuum L.*) is a source of carotenoids renowned for their anti-microbial and antioxidant properties, research into natural preservatives to replace industrial preservatives is growing nowadays. Thus, the impact of red pepper carotenoids as natural preservatives on the quality of tomato paste was investigated. The chemical composition of red pepper, including its moisture, protein, fat, ash, and carbohydrate, as well as its pH, total dissolved solids (TSS), Titration Acidity (TA) and Ascorbic Acid (AA) levels, were determined after being stored in the refrigerator for 40 days. In addition to the control treatment, dyes extracted with acetone and identified using HPLC technology was added to tomato paste made in the lab. at concentration of 0.025, 0.05, and 0.5%. Tests for pH, Titration Acidity (TA), total dissolved solids (TSS), and ascorbic acid (AA) were performed using physiochemical and sensory methods. Where it was noted that all samples during storage of tomato paste at refrigerator temperature at a concentration of 0.5% for 10 weeks and at room temperature for 7 weeks showed a significant decrease in pH, TSS, AA, and sensory evaluation with a significant increase in TA, and the change was significant (p 0.05), it is evident in the physical and chemical characteristics of the samples kept at laboratory temperature that the addition of sweet red pepper dyes can increase the shelf life of tomato paste and enhance its physicochemical and sensory characteristics, particularly the color.

Keywords: paprika dyes**,** tomato paste, qualitative and storage characteristics

1. Food Science Deprt. Collage of Agric.,Basrah-Iraq
2. Food Science Deprt. Collage of Agric.,Basrah-Iraq
3. Food Science Deprt. Collage of Agric.,Basrah-Iraq
4. Bioprocess Engineering Laboratory, Department of Food Science and Engineering, Faculty of Agriculture, University of Tehran, Karaj, Iran
5. Bioprocess Engineering Laboratory, Department of Food Science and Engineering, Faculty of Agriculture, University of Tehran, Karaj, Iran

Manufacturing of a nano-sensor for the purpose of determining the viability of fruit juice

Muthik A. Guda[1*], Shaymaa Ma. Al Regawi[2] , Zainab H. Thajeel[3] and Fatima Hussein Naji[4]

Abstract

The development of chemical sensors and biosensors, especially nanosensors, is an urgent necessity that has attracted the attention of scientists at the present time, which has led to the emergence of new and very interesting sensors with a great future for many areas of applications, including food technology and food packaging technology. Thus, this technology is essential for quality and safety control in terms of consumers and food producers, and has great potential in developing novel nanosensor systems. These experiments were carried out in the laboratories of the Faculty of Science, Department of Ecology, from September to January, 2022-2023.

In this paper, a sensitive colorimetric method is proposed to detect the viability of natural juice by detecting polyphenols (i.e. flavonoids and simple phenolic acids) based on the reduction of Ag+ ions (by reduction) by polyphenols. The color of the stable suspension was controlled by changing the concentration of silver nitrate. Reduction of Ag^{+} to spherical silver nanoparticles (SNPs) by polyphenols produced a very intense surface plasmon resonance (SPR) absorption band of SNPs at 423 nm. Plasmonal uptake of SNPs allows for quantitative spectral detection of polyphenols, and the developed method gave a linear response over a wide concentration range of standard polyphenols. In this work, it was demonstrated that the chromatic aberration in SNPs gave a linear, concentration-dependent response. This test was validated by the rapid response in natural juice samples (pomegranate juice, apple juice, and orange juice), which indicates that the assay is reliable and robust. The properties of silver nanoparticles were diagnosed using FE-SEM to determine the surface

1. Department of Ecology - College of Science - University of Kufa
2. Department of Biology- College of Science - University of Kufa
3. Department of Horticulture and Landscape Engineering - College of Agriculture - University of Kufa
4. Department of Ecology - College of Science - University of Kufa

shape and size. Synthesis of biosynthetic silver nanoparticles. The results showed that the sizes of nanoparticles ranged between 60.27 - 89.80 nm. The atomic force microscope was used to find out the shapes, topography, roughness and protrusions of the surfaces of the silver nanoparticles, as the average roughness of the nanoparticles was 75.54 nm. This research can be applied in smart packaging to detect the validity of juices for human use and remote sensing, where specialized equipment is not available, as well as for high-throughput analysis of a large number of samples.

Key words: silver nanoparticles , nanosensor, food packaging , Antioxidants, fruit juice

Green synthesis of silver nanoparticles using aqueous extract of *Schanginia aegyptiaca* wild plant, and study its antifungal activity against some pathogenic fungi

Muthik A. Guda[1*], , Maytham M. Alabassi[2], Nihad .H.Mutlag[3] and Saif Hussein Abdel Ghazal[4]

Abstract

The purpose of this research is to find an alternative to chemically manufactured drugs such as antibiotics used in the treatment of fungal infections, through nanotechnology manufactured from plant sources (green manufacturing), which is characterized by abundance and low economic cost, as well as possessing an effective inhibition of fungal growth without the occurrence of resistance as a result of genetic mutations. On the other hand, getting rid of the dangerous side effects of chemical drugs used in the treatment of fungal diseases and the ability of manufactured nanoparticles to inhibit fungal cells and reduce toxicity to normal cells in humans. These experiments were carried out in the laboratories of the College of Science, Department of ecology from September to January 2022 -2023. Silver nanoparticles were synthesized using the crude aqueous extract of *Schanginia aegyptiaca*, and their properties were diagnosed and compared with the properties of the crude plant extract. Field emission scanning electron microscopy (FE-SEM) was used to determine the surface structure and compositional size of biosynthetic silver nanoparticles and particles of the crude extract. The results showed that the sizes of the nanoparticles ranged between 60.27 - 89.80 nm, while the sizes of the particles of the crude extract ranged between 53.96 - 113.1 nm. Atomic force microscopy was used to study the shapes, topography, roughness, and protrusions of the silver nanoparticles surfaces and crude plant extract particles, as the average roughness of the nanoparticles was 75.54 nm, while the average roughness of the crude extract particles was 35.97 nm. X-ray diffraction (XRD) was used to measure the size and crystalline nature

1. Department of Ecology - College of Science - University of Kufa
2. Department of Ecology - College of Science - University of Kufa
3. Department of Ecology - College of Science - University of Kufa
4. Department of Ecology - College of Science - University of Kufa

of the above materials, as the average size of the silver nanoparticles was 85.08 nm and the average size of the extract particles was 14.61 nm, and these sizes were calculated according to the Debye-Scharr equation, and multiple peaks of 2 nm appeared that correspond to a database X-ray diffraction ICDD JCPDS File NO:04-0783. The ultraviolet-visible spectrometer was used to detect the silver nanoparticles and the particles of the crude plant extract, as the results showed that the absorption peak of the silver nanoparticles was at the wavelength of 440 nm, which confirms the presence of silver nanoparticles, as well as the highest absorption of the particles of the crude extract at the wavelength 235 nm.

The antimicrobial activity of biosynthetic silver particles against *Aspergillus flavus* was tested *Fusarium oxysporium* at different concentrations (0.75, 1.5 and 3.0 mg/ml) compared to the standard antibiotic tablet Chloramphenicol, and the results showed that the nanoparticles had a higher effectiveness than the bio disk and there was a significant difference at the level of the rate of types of treatments, as the highest inhibition rate for the isolates was 36 mm and the concentration was 1.5 mg. /ml in *A. flavus* fungus, compared to the standard antidote, as it reached 32 mm, while in *F. oxysporium* fungus, the highest inhibition rate was 30 mm for the isolates, at a concentration of 0.75 mg / ml, compared to the standard antidote, as it reached 25 mm, and the significant difference between them reached 10.2 mm. And the silver nanoparticles bio-manufactured from the aqueous extract of the taraea plant, at very low concentrations, proved effective against the studied fungi, which opens the way for the possibility of using them in the field of human medicine later.

Key words: silver nanoparticles , *F. oxysporium*, *food packaging* , Antioxidants, *Schanginia aegyptiaca*

Evaluation of exopolysaccharides (*algD*, *pelF* and *pslD*) genes in biofilm development among *Pseudomonas aeruginosa* isolates from burn wound infection in Hillah/ Iraq

Zeena Hadi Obaid Alwan; Zahraa M. Al-Tae; Liqaa Y. Mohsen; Rafal Ahmed Lilo; and Farah Tareq Al-Alaq. [1]

Abstract

Background: Biofilm is an important virulence factor in *Pseudomonas aeruginosa* and has a substantial role in antibiotic resistance and chronic burn wound infections. **Objective**: This study was aimed to analysis the biofilm capacity within *P. aeruginosa* species isolated from chronic burn wound from January until May 2022 via molecular and biochemical techniques. **Methods**: Quantification of biofilm was performed based on tube method for isolates of *P*. aeruginosa after growing on brain heart Broth. The genes encoding exopolysaccharides (*algD*, *pelF* and *pslD*) were targeted by using conventional PCR. **Results:** The results showed that 92.6% of isolates were biofilm former and interestingly 68% of isolates were considered as strong former comparing with other biofilm categories. Gel electrophoresis result of PCR products presented clear bands for *algD* and *psID* genes with percentages (96%) and (3.7%) respectively. However, there was no PCR product for *pelf* gene among all isolates. **Conclusion**: the prevalence of *algD*, the large operon necessary for alginate production, was high among *P. aeruginosa* biofilm producer in this study and it can be an essential agent in the pathogenicity of *P. aeruginosa* burn wound infections comparing with other biofilm genes (*pelF* and *pslD*) of exopolysaccharide structure.

1. Department of Biology, College of Science, University of Babylon, Iraq

Synthesis of dye solar cells using nanotechnology to produce multi-use electric energy

Kassim Mohammed Sahan, Mazin Mohammed Mawat[1]

Abstract

Dye solar cells called (DSSCs) are considered one of the third generation cells and the most advanced among them, due to their unique and promising features in the field of producing renewable and environmentally friendly electric energy. It has two sides, and it also works in all levels of energy, natural and artificial light of all kinds, inside and outside buildings without being affected much.

The work of this type of solar cells depends on the principle of photoelectrochemical processes similar to the photosynthesis processes that occur in plants in the production of electric energy, through the absorption of (light photons) of natural or industrial light of all kinds, by an industrial dye type (N719) Dye, And converting it into a torrent of excited free (electrons), which are transmitted, through a semi-conductive layer of nano-titanium oxide (Nano-TiO2), which is coated on a conductive layer of (FTO, SnO2: F), which is installed on a glass substrate of silicon oxide of thickness (3mm), to be the negative electrode (PhotoAnode) of the solar cell, and then to transfer these free electrons, through conductive external electrical wires, to the positive electrode of the solar cell (Counter Electrode), which is also coated with an electrically conductive layer of (FTO), which They are coated with a catalyst layer of platinum (Pt), which is in direct contact with an electrolyte solution that carries ionic electrical (gaps) prepared from triiodide, to return lost (electrons) to the industrial dye again.

Where these layers were installed and coated by (Dr. Blend) technology with very high accuracy, so the outputs of the manufactured solar cells were: open circuit voltage (Voc = 0.830 V), short circuit current (Isc = 12.66 mA), fill factor (FF = 75%), and efficiency the total conversion is about (η = 7.90%), at the energy of sunlight (100 mW/cm2), and its transparency is about 30%.

1. The ministry of science and technology College of Medicine /Department of renewable energies. Wasit University

Preparation and Characterization of poly (O- Toluidine-Carbon nano tube) Nano films and Study of optical

Tuqa MJ. AbdulKadhim[1] , Mohammed Hadi. Shinen[2]

Abstract

In this study, nano films were prepared from poly (O-toluidine) (POT) and the structural, optical and electrical properties were studied, and then POT was mixed with nanomaterial (Multi-walled Carbon Nanotubes) (MWCNT) in certain proportions of the size to form nano-membranes With distinctive characteristics. Properties: The solution is deposited on the bottles by spin coating method (2000 r/m in 10 seconds), the prepared membrane samples by determining their crystalline nature by X-ray diffraction, and studying the surface morphology of the deposited films using scanning electron microscopy (SEM) and atomic microscopy (AFM), studying the optical properties by obtaining the absorption and transmittance spectrum in the UV visible regions as a function of wavelength to find the optical energy gap as well as the refractive index, as well as the extinction coefficient and the dielectric constant. It included the study of the electrical properties of the final films, which included electrical conductivity, as well as the study of testing overlapping films such as solar cells and gas sensors to know the characteristics of the current voltage, the packing factor, the efficiency of the solar cell and then the sensitivity in different conditions such as the temperature test. The optical properties of the prepared thin films were studied, including absorption spectrometry recording for wavelengths (300-800 nm), and it was found that the absorption (A) and extinction (K) coefficients increased with increasing rates from (MWCNT) (90:10, 80:20, 70:30). , 60: 40, 50: 50) and the energy gap values are reduced, which leads to an improvement in the optical properties.

1. Department of Science, Collage of Basic Education, University of Babylon, babel, Iraq
2. Department of Physics, Collage of Science, University of Babylon, babel, Iraq

A Literature Review on the Antifungal Effect of an Acrylic Resin Denture Base Containing Nanoparticles

Shahad Fadhil Bunyan[1], Suzan Adil Rashid Al-Naqeeb[2]

Abstract

Introduction: Candid albicans is the main oral pathogen that causes denture stomatitis. It happens while wearing removable dentures as a result of several contributing and causing variables. It may cause deadly systemic candida infections if left untreated. Various substances and methods have been used to treat denture stomatitis, however, no one therapy has been effective.

Method: Electronic databases for scientific research, including PubMed, Cochrane, and Medline. The following keywords were used: nanoparticles, antifungal, candida albicans, acrylic resin denture base, and nanotechnology. Initial retrieval of 1430 original papers from the aforementioned worldwide databases was done after careful screening. Includes reviews of the literature on the antifungal effects of the nanostructured acrylic resin denture base particles. At the first stage of our study, case reports, clinical trials, editorials, and opinion letters were not included. 28 papers were finally chosen and examined since they satisfied all selection requirements.

Results: The current study's findings demonstrated the fungicidal activity of acrylic resins containing TiO_2 NPs and Ag NPs are the best antifungal properties against C. albicans by best concentration of 1% of TiO2 NPs and Ag NPs in the treated groups was substantially less than the untreated control group.

Conclusion: The addition of nanoparticles may enhance the acrylic resin denture base's antifungal capabilities by reducing the

1. Nursing Techniques Department, Kirkuk Technical Institute, Northern Technical University, Kirkuk, Iraq
Correspondence
Shahad Fadhil Bunyan
Kirkuk Technical Institute, Northern Technical University, Kirkuk
2. Nursing Techniques Department, Kirkuk Technical Institute, Northern Technical University, Kirkuk, Iraq
Correspondence
Shahad Fadhil Bunyan
Kirkuk Technical Institute, Northern Technical University, Kirkuk

development of Candida albicans.

Evaluation of knowledge among pregnant women about non-prescribed medications in Kirkuk city

Running title: Knowledge evaluation for pregnant women

Keywords: knowledge, pregnant women, dental medication, Kirkuk city

Nursing department, Kirkuk technical institute,
Northern technical university
Iman Salman Hasan

Abstract
A random sample of pregnant women attending outpatient obstetrics and maternity clinics at randomly chosen public general and teaching hospitals in Kirkuk city are evaluated for their knowledge of the non-prescribed medicine used in the study. 100 women participate in total. Iraqis between the ages of 20 and 40 who were employed, had no background of abortion, had experienced a medical issue within the previous year, had a better perception of their health, knew how to use medications during pregnancy, and needed information on medications were much more likely to be aware that a pregnant woman with a chronic condition must discuss whether or not to take a medication with her doctor. Employed women, those who received information from doctors, those who knew how to use medications during pregnancy, and those who were aware of the potential harm associated with medication use had significantly higher knowledge of the potential risk of using non-prescribed medications. More than half had taken one or more prescription drugs, and more likely to use medication were those who were between the ages of 20 and 25, Iraqi, non-graduated, in their second trimester, had experienced a medical issue within the previous year, were carrying a high-risk pregnancy and knew that women with chronic conditions must discuss whether or not to take a medication with their doctor. Fewer than half had taken drugs without a doctor's prescription. Young, Iraqi, multiparous, without a history of abortion, knowing that women with chronic conditions must discuss whether or not to take a medication with their doctor, unaware of the potential risks of using non-prescribed medication while pregnant, having used prescribed medication while pregnant, and in need of information about medications were those who were most likely to self-medicate.

Biosynthesis of Mgo Nanoparticles By *Lactobacillus rhamnosus* and Estimated Antibacterial Activity against Opportunistic Pathogens

Nawfal Hussein Al-Dujaili [1], Zahraa K. Lawi[2] , Dhifaf Zeki Aziz [3], Zahraa Isam Jameel [4]

Abstract

The use of lactic acid bacteria in the manufacture of MgO nanoparticles (NPs) might be an environmentally acceptable alternative to chemical and physical approaches. The objective of this research was to look at magnesium oxide's biological activity against the XDR bacteria *Pseudomonas aeruginosa* isolated from burn infections. Lactococcus *rhamnosus* were isolated and identified from dairy products, and magnesium oxide (MgO) nanoparticles (NPs) were synthesized by *Lactobacillus rhamnosus*. Many characterizations, including UV-vis spectroscopy, XRD FE-SEM with AFM, and TEM, were used to confirm the formation, shape, crystallinity, functional groups, morphology, topography, and size of the produced MgO NPs. The XRD analysis of the produced NPs revealed a spherical structure with a crystalline size of 25.94 nm. FE-SEM was used to examine the manufactured MgO NPs, which had an average particle size of 64.55 nm. MgO NPs were examined for antibacterial activity against three isolates of *P. aeruginosa* (MDR) bacteria in the current study, and the MIC and MBC for MgO NPs were determined using the dilution technique .To interpret the results, the inhibitory zone sizes were measured. Bacterial growth inhibition was assessed as zone diameters (mm) at 3 equidistant places chosen from the center of the inhibition zone, with the average value of all observations taken. where the results showed the effectiveness of inhibition of MgO NPs against bacteria, and this result is consistent with that which found that the MgONPs show the maximum

1. University of Kufa - College of science- Department of biology, Najaf 54001, Iraq.
2. University of Kufa - College of science- Department of biology, Najaf 54001, Iraq.
3. University of Kufa - College of science- Department of Psychological analysis, Najaf 54001, Iraq.
4. University of Al-Qasim Green - College of science- Department of Pathological analysis, Al-Qasim-8, Babil 51001, Iraq.

antibacterial activity towards *P. aeruginosa*. Therefore, the present findings prove that the fabricated MgO NPs have potential cell viability and possess antimicrobial agents.

Key words: Nanotechnology , antibacterial activity of Mgo , XDR bacteria.

Induced resistance using normal and nano-chitosan against the fungus *Rhizoctonia solani* Kühn that causes watermelon root rot disease.

Ghada Majid Al-Ghanimi Hamed Abdzaid Al-Khafaji Oras Muhsen Kadim[1]

Abstract

The study aimed to use normal and nano-chitosan at concentrations of (1, 3, 5, 10 and 15)% in stimulating acquired systemic resistance and defense responses of watermelon plants against the fungus Rhizoctonia solani that causes watermelon root rot disease under laboratory and greenhouse conditions. The estimated pathological results of R. solani showed that the germination rate of watermelon seeds was 20% compared to 100% in the comparison treatment, and the infection severity was 100.00%. The results also showed the addition of normal and nano-chitosan to the culture medium to test its effectiveness against the fungus R. solani that causes watermelon root rot disease. The results showed inhibition of the growth of R. solani by using concentrations of 5, 10 and 15%. The highest inhibition rate is 100.00%. pathogenic fungus under laboratory conditions.

While the spraying of normal and nano-chitosan and the interaction between them on the plants treated with the pathogenic fungus achieved a significant reduction in the rate and severity of infection compared to the comparison treatment, as the infection rate was (44.44, 33.33, and 11.11)% and its severity was (15.55, 6.66 and 4.44)% for the normal and nano-chitosan and the interaction between them on The sequence compared with infection rate of 100.00 and severity of 95.55% with control treatment under greenhouse conditions. These results indicate the possibility of using regular and nano-chitosan as an alternative to chemical pesticides in the management of watermelon root rot pathogens.

1. Al-Mussaib Technical Institute, Al-Furat Al-Awsat Technical University, 51009, Babylon Province, Iraq.

Natural Reserves legal development in Iraqi Ecosystem

Shahla Hussien Hano[1] , , Dr. Abdalkader Saeed Latif[2], Dr. Reyam Naji Ajmi[3] ,Estabraq Mohammed Ati[4]

Abstract

: Reconciliation with the environment is the primary task of all humanity in the twenty-first century, and it is necessary that this matter be a top priority for everyone around the world, as the path of destruction and deterioration of nature must be reversed by preserving biological diversity in various ways. Human interventions seriously affect seventy-five percent of all land and nearly half of all terrestrial and aquatic ecosystems. Nature is intrinsically linked to humanity, as people have a deep relationship with the ecosystems in which they live, as the latter provide the essence of their survival, from fertile seas and soils to fresh water and a stable climate, and we must be aware that the continued loss of species and habitat degradation threatens the survival of humanity. The establishment of protected areas is one way to protect biodiversity, as it represents a global approach that supports the preservation of nature, and it has been present in all countries of the world since ancient times in land and marine areas to ensure the continued presence of biodiversity that supports human life.

Keywords: Natural reserves, Sustainable development, Iraqi legal

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1. Collage of Medicine,Ibn Sina University of Medical and Pharmaceutical Sciences, Iraq,Baghdad
2. National University of Science and Technology / College of Health and Medical Technology
3. Department of Biology Science, Mustansiriyah University, POX 46079, Iraq-Baghdad.
4. Department of Biology Science, Mustansiriyah University, POX 46079, Iraq-Baghdad.

Evaluation of the inhibitory effectiveness of *Euphorbia prostrata* and *Euphorbia hypericifolia* extracts in inhibiting the growth of two pathogenic fungi, *Alternaia alternata* and *Fusarium solani*

Jaffer Fadhil Abbas[1] ; Shaemaa Muhi Hasson AL-Amery[2] ; Ibtihal Muiz Al-Hussaini[3]

Abstract

Background:The current study included the preparation of an aqueous-alcoholic extract of species *E.prostrata* and *E.hypericifolia* leaves (herbaceous plants belonging to the genus *Euphorbia* (Euphorbiaceae) spread in Iraq) and showing the effect of the extract on some pathogenic fungi *Alternaria alternata* and *Fusarium solani* as a comparative study between the two species.The disk-diffusion method(MIC) and the well diffusion method were used to determine the minimum inhibitory concentration at concentration (5,10,15,20%) to evaluate the effectiveness of the plant extract of both species against both fungal isolates with Calculate the percentage of inhibition. **Results**: The results of the statistical analysis showed that the methanolic extract of *E.prostrata* leaves had higher inhibitory activity for the studied fungi compared to the extract of *E. hypericifolia* leaves.The highest inhibition rate for *A.alternata* was (100,100)% and for *F.solani* (91,100)% at concentrations(15,20). While the inhibitory percentages of *E. Hypericifolia* leaves extract for *A.alternata* (85, 89)%and for *F.solani* (84,88) at the same concentrations. Also,The results showed a variation in the sensitivity of fungi to plant extracts.The fungus *A.alternata* was more sensitive to the plant extracts than *F.solani* , specifically using the Well method.**conclusions:** The results of the current study confirmed the importance of the alcoholic extract in inhibiting or reducing the growth of fungi, especially*E.prostrata* leaves extract .

Keyword: Euphorbia prostrata , Euphorbia hypericifolia , Fusarium, Alternaria , Plant extract .

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1. Department of Biology , College of Science , University of Babylon ,Iraq.
2. Department of Biology , College of Science , University of Babylon ,Iraq.
3. Department of Biology , College of Science , University of Babylon ,Iraq.

Study of the structural and optical properties of TiO_2 thin films prepared by pulsed laser deposition technique and doped with Al_2O_3

Zinab saad Mahdi[1], Rafid M.Abdullah[2], Zaid Abulhadi Abed[3], Ali A.Sallal[4]

Abstract

In this work, nanostructured TiO_2 thin films were grown by pulsed laser deposition (PLD) technique on glass substrates. TiO_2 thin films and impurity by different percentages of alumina oxide (Al_2O_3) (1, 3 and 5%), effects of the impurity on the structural and optical properties were studied. The results of the X-ray test show that all nanostructures tetragonal are polycrystalline. Grain size decreases with the increase in the percentage of impurity while the full width at half maximum increases with the increase in the distortion rate. The results of the optical properties, we notice that the transmission decreases when the percentage of impurity increases and we note the lowest absorbance we get at pure within the region UV as for the ratios 1%, 3% and 5% the absorption increases with increasing wavelengths. It falls within the region of VIS, We notice that the energy gap decreases with the increase in the doping ratio through the values (3.78, 3.38, 3.25, and 2.98 eV). We also note that the refractive index and the real and imaginary dielectric constants increase with the increase of impurities in the visible spectrum region.

Keywords: aluminum oxide, TiO_2 Films, Pulsed Laser Deposition, Structural, optical properties.

1. University of Diyala / College of Science / Department of Physics
2. University of Diyala / College of Science / Department of Physics
3. University of Diyala / College of Science / Department of Physics
4. University of Diyala / College of Science / Department of Physics

Synthesis PEG-cobalt nanoparticles by hydrothermal and study the Antibacterial activity on *Escherichia coli* and *Staphylococcus aureus*

Abdulkadhim,w.k. [1] , Mohammed Abd Ali Hussain[2]

Abstract

The hydrothermal technique was used to create the cobalt nanoparticles with polyethylene glycol (PEG) caps, and the antibacterial activity of the particles was tested against *Staphylococcus aureus* and *Escherichia coli*. By using X-ray diffraction (XRD), scanning electron microscope (SEM), vibrating sample magnetometer (VSM), and Fourier transform infrared (FTIR) spectroscopy, the functionalized nanoparticles were characterized. The PEG-Co ranged in size from (11 to 23) nm on average. Superparamagnetism and strong saturation magnetization were present in the PEG-Co at room temperature. The agar well-diffusion technique was used to assess the PEG-Co antibacterial activity *against E. coli* and *S. aureus.* The morphological alterations in the investigated bacterial species were seen with the naked eye. The outcomes demonstrated the effectiveness of polyethylene glycol-functionalized (PEG-Co) nanoparticles as a new DNA-mediated antibacterial agent. By penetrating the bacterial nucleic acid and cytoplasmic membrane, the PEG-Co nanoparticles were found to kill bacteria by causing cell-wall permeability to rise, cell-wall integrity to be lost, and nucleic acid damage.

1. Department of pathological analyzes ,College of Science, Wasit University, Iraq.
2. Department of Biology, Faculty of Sciences, Ilam University, Ilam, Iran.

Assessment of some Apoptotic Biomarkers and Correlation with Kidney Function Biomarkers in Hemodialysis Patients

Israa Nadhim Habeeb [1], Maysaa Adil Hadi[2]

Abstract

The clinical management of renal disease may benefit from additional therapeutic approaches if the processes of physiologic cell death (apoptotic or programmed cell death) are better understood. This study aimed to investigate some apoptotic biomarker levels and their correlation with kidney function biomarkers in hemodialysis patients. The current study included 82 hemodialysis patients with age (51.6 ± 15.04) years and healthy control with age (49.8 ± 14.19) years. The results showed presence of significant differences in the percentage of hemodialysis males and healthy males ($p < 0.001$) and between hemodialysis and healthy females ($p= 0.002$). According gender, there was significant increasing of creatinine, urea, and uric acid levels in both hemodialysis males and females compared to healthy males and females as well as between hemodialysis patients and healthy control groups. Moreover, hemodialysis males and females had significant decreasing in p53, Bcl2, and Fas levels compared to healthy males and females with significant decreasing between hemodialysis patients and healthy control groups. According age, the age group (40-59) years and (60≤) years had more percentages of hemodialysis patients. Significant differences was found between the same age groups in hemodialysis and control groups which were ($p= 0.05$), ($p= 0.004$), and ($p < 0.001$) in (20-39) years, (40-59) years, and (60≤) years respectively. The results indicate significant increasing in serum creatinine, urea, and uric acid levels between hemodialysis and control groups in same age group (20-39) years and (40-59) years while uric acid levels increased significantly in (40-59) years and (60≤) years age groups. The apoptotic biomarkers showed significant decreasing of p53 and Fas levels in all age groups while Bcl2 levels had significant decreasing only in (40-59) years and (60≤) years age groups.

1. Department of Basic Sciences, College of Dentistry, University of Babylon, Iraq.
2. Department of Biology, College of Science, University of Babylon, Iraq.

Moreover, significant differences was found: body mass index (BMI) coteries, family history, smoking habit, and corona virus infection between hemodialysis and healthy control group. Furthermore, the correlation results referred to weak negative correlation between uric acid with caspase-9 levels ($r= -0.3$, $P= 0.33$) and positive significant correlation between caspase-9 with P53 levels ($r= 0.770$, $P< 0.001$) in hemodialysis group. In conclusion, apoptotic biomarkers may be give assistance for extra therapeutic methods.

Design of a New Generation Low-Cost Advanced Soft Nano-Artificial Heart for Permanent Use

Saad Mahmood Ali, Shurooq Saad Mahmood

Abstract

The biomechanical behavior investigating of the soft artificial heart is a hard task since it is very complicated in material properties and geometry. The current work was focused on developed, designed, modeled and analyzed of a new generation, low cost, easily operable, real size, low power consumption and durable soft artificial heart required to replace the living heart permanently. The numerical simulation and investigation of the artificial heart were implemented by using the SOLIDWORKS 17, the ANSYS 15.7 software programs, the Multiphysics static structural, the fluent fluid flow (CFX) and fluent fluid poly-flow (CFD) analysis systems to determine the dynamic response of the pressurized blood on the heart performance during the activity of the blood flow cycles. The biomechanics modeling and analyzing of the soft artificial heart were implemented by using the finite element ANSYS R18.0 software programs. To improving and verifying the biomechanical performances, the Design Expert 11.0 software program and the response surface methodology (RSM) technique were used. The simulation results show that during the maximum level of absolute pressure applied on ventricles and air pressurized chambers, the animated graphs showed that the performance of the heart is completely safe. The results also show that strain energy, the total deformation, the maximum principal elastic strain, the stress and fatigue safety factors, and the fatigue lives were reached thier optimum values when using the SIBSTAR 103T and the polyetherimide/silicone (PSN4) Nano-composite elastomers.

A review of carbon nitrides in lithium-ion battery anodes

Samira mohammadi

Abstract

Lithium-ion batteries are the most durable rechargeable batteries among other batteries that are used as power sources in portable devices and electric vehicles. Graphite has been adopted as the preferred negative electrode (anode) material for LIBs. Because it is economical, it works with low voltage, it is compatible with the environment, it does not have many changes in volume, it has a relatively stable cycle life, but its theoretical capacity is relatively low. One of the effective ways to improve the properties and electrochemical performance of graphite is through doping materials as graphite anode. Nitrogen doping provides an effective role in tuning the properties of graphene. Carbon nitrides are a family of nitrogen-rich graphites that have porous defect sites for charge transport. In this article, carbon nitrides based on pyridinium nitrogen (CN, C2N, and C3N4) and carbon nitrides based on graphite nitrogen (C3N, C4N) were investigated as anodes in LIBs. And the obtained results showed the role of heat treatment, reduction of nitrogen atoms, types of nanostructures of a carbon nitride, different configurations and increase of carbon atoms in improving the performance of batteries.

A review of Common Misconceptions of Students in High School Chemistry Education in Physical Chemistry Subjects

Mohammad Salehi avval[1]

Abstract

Misconceptions refer to any kind of false notions that cause non-scientific beliefs, confused concepts, simple concepts and theories without scientific roots. Misconceptions cover a wide range of scientific concepts. Misconceptions not only in chemistry, but in other fields at all levels cause major problems for science educators, scientific researchers, teachers and students. If the concept in question is scientifically Abstract:
and incomprehensible oncepts, it will be much more necessary to recognize Misconceptions and deal with them. The present article, is a kind of review article in which the subject of common Misconceptions of students in teaching chemistry in the high school has been discussed. In explaining chemistry concepts, vague terms and definitions should not be used and clear and understandable explanations should be used. Teachers should refrain from providing redundant data to students. It is also a very good solution for teachers to be familiar with different types of misconceptions in different lessons.

Keywords: Misconception, Chemistry education, Chemistry, Physical Chemistry.

1. Bachelor student of Chemistry Education, Farhangian University, Tehran, Iran.

Examining the 12th Chemistry Textbook on Physical Chemistry Subjects

Mohammad Salehi Avval[1]

Abstract

Today, chemistry is known as a comprehensive and widely used science in all fields of life, and the progress and evolution of many sciences and modern industries are somehow related to this science. Therefore, the existence of scientific studies and the level of providing educational goals seems to be a necessary educational content. The textbook, as the main scientific source for guiding teacher and student activities in order to achieve educational goals, is of interest to educational planners. The result of this review article showed that the content analysis of textbooks makes the authors use the results to improve the book. High-quality textbooks are not only the main source of knowledge, but also help to develop personality, individual skills, arouse interest in learning and support interpersonal activities of students. For students, the textbook is considered as a framework that helps them organize their learning inside and outside the classroom.

Key words: Textbook, Chemistry, Chemistry Education, Physical Chemistry.

1. Bachelor student of Chemistry Education, Farhangian University, Tehran, Iran.

A New And Innovative And Efficient Approach To Prepare And Produce Multi Layer Graphene With Optimal And High Quality

Amir Shateri*[1]

Abstract

In this research and article, a new and innovative approach to prepare and produce high quality graphene is proposed, Which was realized by exfoliation of KOH etched graphite in H2O2 solution under microwave radiation. The prepared graphene has properties such as being smooth, polished and transparent, and has high electrical conductivity 2×10^5 S.cm. Compared with the conventional oxidation reduction method, the present method is significantly, it does not include the use of acid and strong oxidizing agent, which makes it more capable in the scalable production of graphene.

1. A Continuous Undergraduate Student Of Electrical Engineering At Apadana Institute Of Higher Education, Shiraz

Using Nanocomposite Hydrogels for Delayed Drug Delivery

Seyede Neda Hosseini[1], Mohammadmahdi Akbari Edgahi[2]

Abstract

In recent decades, hydrogels with their unique properties have been used in various industries such as food, packaging, pharmaceutical, bioengineering, etc.the application of hydrogels in medical field is highlighted as they can be used in tissue engineering, contact lenses, wound dressings, and the release of therapeutic agents due to their structure similar to the extracellular matrix (ECM) and the ability to absorb water. Hydrogels are polymer compounds with a three-dimensional structure that are cross-linked which can carry medicin and release it under a controllable profile. Therefore, hydrogels are highly used in drug delivery systems. Among several type of hydrogels that are used in the field of drug delivery, nanocomposite hydrogels have better structure. This type of hydrogels acts as a drug transfer agent by using a sensitive area that allows the drug to stick to it that are in the form of nanoparticles, nanotubes, or nanocapsules (the drug is surrounded by a polymer). Many new hydrogels are designed in such a way that they perform gelation under physiological conditions. In these systems, the hydrogel is formed at the injection site without the help of cross-linking agents, which are often toxic and alter nature. However, biocompatibility of hydrogel is the most important factor to consider. In this seminar, we covered the types of hydrogel and nanomaterials that are use in drug carrier and their formation methods, along with the biochemical nature to provide sufficient information for the scientific society.

Keywords: Hydrogel**,** Drug delivery**,** Biocompatibility**,** Biomedical**,** Nanotechnology

1. Nanotechnology Department, School of Advanced Technologies, Iran University of Science and Technology, Tehran, Iran
2. Nanotechnology Department, School of Advanced Technologies, Iran University of Science and Technology, Tehran, Iran

A Review Article of Tuberculosis Disease Burden and Epidemiology

Israa Mamdooh Subhi[1] and Teeba Ghazwan Albadri[2]

Abstract

Tuberculosis (TB) has been known to cause high mortals through the last 200 years compared to other infectious diseases, and has been discovered since ancient times (Paulson, 2013). Although TB is often thought of as a historical disease in the developed world, this is not the case. Globally in 2012 there were an estimated 8.6 million new cases of active TB and 1.3 million deaths; therefore; there is one new TB case every 4 seconds and more than two TB deaths every minute. Overall, it is estimated that just 64 % of incident TB cases were notified to National TB programmes in 2013 (WHO 2014). In high burden settings, TB has its peak incidence in early adulthood, affecting the most economically productive age-groups. Whilst in low burden countries, TB is more common in the elderly; also in immigrant populations and the socially destitute. The National TB surveys for prevalence can give a useful measurement of the number of people in the population with bacteriologically confirmed pulmonary TB at a given point in time, and the arrangement of these cases by age and sex. The continuous repeated surveys would assess trends and the effect of interventions to decrease the burden of the disease in such period since the last survey. The latest survey of the World Health Organization (WHO) showed that between 2000 and the end of 2021, the total number of 41 surveys were conducted in 33 countries. They included repeated surveys in Cambodia, the Philippines, China and Viet Nam using the recommended and approved diagnostic and screening methods. Consequently; this review will outline the continuous prevalence of TB worldwide in order to track the burden of the disease and encourage the countries to make more surveys annually.

Keywords: Epidemiology, prevalence, populations, burden

1. Department of Nursing Techniques, Medical Technical Institute, Middle Technical University, Baghdad, Iraq
2. Ibn Sina University of Medical and Pharmaceutical Sciences, Baghdad, Iraq
Corresponding Author: Israa Mamdooh Subhi

The Effectiveness *Sesamum indicum* L. Seeds Extract Against Dermatophytosis

Azhar Jabbar Khalaf Al Subaihawi [1], Taqi Mohammed Jwad Taher [2], Ali kareem [3], Ali Abdl Husseen jawad [4]

Abstract

In the present study, we evaluated the antimicrobial activity of *Sesamum indicum* L. seeds extract against Dermatophytosis pathogens including that responsible for human infection. Sensitivity testing against some pathogenic fungi were studied with sesame seed extract. *Trichophyton mentagrophytes* and *Trichophyton rubrum*. were the microorganisms used and they were identified, confirmed and obtained from the Biology laboratory of the hospital of waist, Iraq. The results showed that the inhibitory activity of the extracts against the tested fungi depended on the type of fungi, the extract type (alcohol or acetone), and its concentration. As a result of the strong tendency that has emerged recently to use plants and their active ingredients in the medicine.

The acetone extract has a high inhibitory activity, followed by the alcohol extract This article focuses on natural products used as antifungal properties, their effects on the minimum inhibitory concentration value, as well as their environmental value. The study suggested that sesame seeds are potential sources of functional food to prevent chronic diseases.

1. Dermatolog/ College of Medicine/ Wasit University
2. Family and Community Medicine Department/ College of Medicine/ Wasit University
3. sarbout Biology Department College of Biology/ Wasit University
4. Ministry of Health ,Wassit Health Directorate , Wassit Governorate ,Iraq

Preparation of polymeric membrane containing Quasi Metal-Organic Framework UIO-66 for removal of anionic pollution from water

Ali safari[1], Farhad heidary[2], Mohammad yaser masoomi[3]

Abstract

Fluoride is one of the water-soluble ions that originate from natural and artificial sources, e.g., the industrial effluents discharged from plants producing aluminum and steel, semiconductors, and glass. To remove this anion, the fluoride ion selective electrode method is very suitable and advanced. In this research, a biodegradable polymeric membrane (cellulose acetate) containing quasi metal-organic framework (Quasi MOF UIO-66) has been used to remove fluoride from an aqueous solution. XRD analysis showed that the transformation of the metal-organic framework into a quasi-framework did not affect the crystal structure of the final material. FTIR analysis also showed that there were functional groups related to carbon, hydroxide and zirconium bonds in the structure, which indicated the correct synthesis. SEM images also revealed that the dispersion of nanoparticles in the composite is appropriate and favorable. The effect of different factors such as adsorbent content and fluoride pollutant concentration were investigated. The obtained results showed that in the study of adsorbent content, the best adsorption performance is for 0.1 g of adsorbent. On the other hand, In the initial concentration of fluoride, the lower the concentration, the better the adsorption efficiency.

Keywords: quasi metal-organic framework, cellulose acetate, fluoride

1 PHD student of nanochemistry and chemistry teacher
2 Professor of Applied chemistry in University of Arak
3 Professor of Inorganic chemistry in University of Arak

Green synthesis and characterization of nitrogen-doped carbon quantum dots (NCQDs) from lemon juice as fluorescent nanoparticles with antibacterial properties

Fatemeh Hassanpour Suderjani*[1], Ehsan Davami[2], Dr. Morteza Sadeghi[3]

Abstract

Carbon quantum dots (CQDs) are a class of fluorescent nanomaterials with very small particle size (less than 10 nm). CQDs have special properties such as high solubility in water, excellent biocompatibility and stability against photo degradation. Therefore, these nanoparticles were considered in various applications such as surface modification of polymer membranes, bio imaging and photo catalyst. In the field of membrane technology, one of the main challenges for reclamation of industrial wastewater is membrane fouling. One of the solutions to reduce membrane clogging is to modify the surface using hydrophilic nanoparticles. The aim of this research is the synthesis of carbon quantum dots combined with nitrogen (N-CQD) as hydrophilic nanoparticles. Due to the presence of hydrophilic hydroxyl functional groups, these nanoparticles improve the surface properties of the membrane and, as a result, reduce membrane clogging. In this research, NCQD was synthesized by hydrothermal method using the combination of lemon juice as a carbon source and ethylene diamine as a nitrogen source. Optical properties and functional groups on the surface of this nanoparticle were studied using visible-ultraviolet spectrophotometer and Fourier transform infrared spectroscopy (ATR-FTIR). Also, the particle size distribution of synthesized nanoparticles was confirmed by dynamic light scattering (DLS) test, and the antibacterial properties of these nanoparticles were measured using disk diffusion test. The findings of this research indicate that NCQDs synthesized by hydrothermal method have high quantum yield, narrow size distribution, good solubility in water and high bactericidal ability.

Keywords: carbon quantum dots, membrane technology, nanoparticle, antibacterial.

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1. Department of Polymer Engineering, Faculty of Chemical Engineering, Isfahan University of Technology
2. Department of Chemical Engineering, Faculty of Chemical Engineering, Isfahan University
3. Department of Polymer Engineering, Faculty of Chemical Engineering, Isfahan University of Technology

Teaching Nanotechnology and Teaching Green Chemistry and Connecting Them with Physical Chemistry and Biology

Mohammad Salehi Avval[1*], Amirmohammad Bahrami Maddah

Abstract

Due to the great importance of green chemistry to preserve the environment, prevent the destruction of natural resources and create a healthy and natural life, during the past several decades, green chemistry has emerged as an important part of chemistry education and is expanding rapidly. A variety of educational materials have been created to teach the twelve principles of green chemistry to students in schools and universities in all countries. The current article is a type of review article that examines emerging sciences such as nanotechnology and green chemistry, as well as the impact of its education in basic sciences. Among the advantages of nanosciences with other sciences is to enable students to better understand and communicate between sciences. One of the advantages of including science and nanotechnology in the curriculum of students is that it enables them to make a more logical connection between the concepts of physics, chemistry and biology and the application of nano in those fields. It is hoped that with future support, nanotechnology and green chemistry will reach their true position.

Keywords: Nano, Nanotechnology, Green Chemistry, Physical Chemistry, Biology.

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1. Bachelor Student of Chemistry Education, Farhangian University, Allameh Amini Campus, Tabriz, Iran.

Investigating the necessity and importance of teaching Green Chemistry in schools and its impact on teaching physical chemistry and biology

Mohammad Salehi Avval[1]

Abstract

Green chemistry is a branch of chemistry that tells about the need to pay attention to the environment and the importance of renewable materials through chemistry at different levels for different ages of students. The teaching of the principles and conditions along with the teaching points and requirements of green chemistry should be included in the students' educational units from the lower levels with methods such as curriculum, teaching methods, experiments, etc. The positive and effective influence of green chemistry in the surrounding environment and its new solutions in advancing environmental goals and sustainable development can help a lot in creating trends in students and the advancement of new strategies in the world arena through a specialized study in the new and innovative science of green chemistry. In this review article, we come to the conclusion that green chemistry is our road map in using nature. In fact, green chemistry is the conscience of chemistry. By using the unique capacities of education and training in the field of green object education in the fields of experimental and mathematical sciences and general education in all fields, it is possible to have a great impact on changing and reforming life and personal and social habits.

Key words: Green Chemistry, Chemistry Education, Chemistry, Physical Chemistry, Biology.

1. Bachelor student of Chemistry Education, Farhangian University,Tehran, Iran.

Experimental investigation of the morphology of worn surfaces of nanocomposite gears

Rasool Mohsenzadeh[1*], Mohammad Ejlali

Abstract

Basically, gears are an evolved form of friction wheels that have teeth added to them to prevent slippage and ensure relative motion uniformity. The effect of adding carbon black to pure POM and also the effect of adding calcium carbonate nanoparticles with 1.5, 3 and 4.5 weight percentages to the POM-carbon black mixture on the morphology of POM base gears were studied experimentally. To investigate the wear mechanisms at different time intervals for pure and nanocomposite samples, the gear test was performed under a constant torque of 10 Nm with a constant rotational speed of 1500 rpm. The gear test was stopped every 20,000 cycles and continued with a new pair of gears and this procedure continued until the moment of gear failure. This method eliminates the error caused by temperature drop in successive stops. The wear mechanism in gears was studied using microscopic images. Examining the gear wear surface with scanning electron microscope showed that the wear mechanism changes from sticky wear to abrasive wear with the use of nanoparticles. The surface of the sample containing 1.5% and 3 wt% of calcium nanocarbonate was much smoother than the pure POM gear and the sample containing nanocarbon black, although signs of wear chips and scratch wear were observed on the wear surface. Compared to the sample containing 1.5 wt% calcium carbonate, the surface of the sample containing 3 wt% calcium carbonate is smoother and also the extent of scratch wear in the sample containing 3 wt% calcium carbonate is less than other samples.

Keywords: morphology, nanocomposite gears, wear mechanism

1. Department of Mechanical Engineering, Technical and Vocational University (TVU), Tehran, Iran

Experimental investigation of impact resistance and toughening mechanisms of nanocomposite

Rasool Mohsenzadeh[1*]

Abstract

The appearance of nanotechnology provides the necessary potential to increase the physical properties of polymer materials, which causes a decrease in the coefficient of thermal expansion, an increase in stiffness and strength, thermal resistance, without reducing impact strength. The effect of adding carbon black to pure POM and the effect of adding calcium carbonate nanoparticles with 1.5, 3, and 4.5 wt% to the POM-carbon black mixture on the of POM base were studied experimentally. Morphology and impact resistance of different samples were tested. The addition of carbon black nanoparticles led to a 23% increase in impact resistance compared to pure POM. In addition, the addition of calcium carbonate nanoparticles up to 1.5wt% along with carbon black nanoparticles led to an increase in toughness up to 49% compared to the pure polymer. However, the addition of more than 1.5% wt% of calcium carbonate nanoparticles along with carbon black has reduced the relative impact strength compared to other nanocomposite mixtures. Agglomeration of calcium carbonate nanoparticles in high weight percentages reduces the impact strength because these agglomerates act as stress concentration centers and play an effective role in facilitating crack propagation and reducing failure energy absorption.

Keywords: Morphology, nanocomposite, impact resistance

1. Department of Mechanical Engineering, Technical and Vocational University (TVU), Tehran, Iran

Experimental study of viscoelastic behavior of ternary nanocomposite

Rasool Mohsenzadeh[1*]

Abstract

Viscoelastic material, as its name suggests, has a combination of two different behaviors. The effect of adding carbon black to pure polyester and also the effect of adding calcium carbonate nanoparticles with weight percentages of 1.5, 3 and 4.5 to POM-carbon black mixture on the viscoelastic behavior of POM were studied experimentally. The addition of calcium carbonate nanoparticles along with carbon black led to an increase in the storage modulus and elastic behavior of nanocomposite samples in all temperature ranges. This increase for nanocomposite containing carbon black and nanocomposite containing 3 wt% of calcium carbonate nanoparticles along with carbon black at 100 degrees Celsius was 80% and 110%, respectively, compared to pure POM. The glass transition temperature of the sample containing 3 wt% of calcium carbonate nanoparticles along with carbon black is higher than other samples. The main reason of this phenomenon can be attributed to the strong interaction between hard and rigid nanoparticles and the POM matrix, which causes the absorption of the molecules of the POM matrix on the surface of the filler nanoparticles. The loss modulus for nanocomposites is higher than pure POM. The highest amount of loss modulus increase occurs in the sample containing 3 wt% nano calcium carbonate, due to the high rigidity of nanoparticles and strong interaction with the polymer matrix. The loss modulus increases with the increase in the percentage of nanoparticles and after reaching an optimal value, it decreases with a further increase in the amount of nanoparticles.

Keywords: Viscoelastic, nanocomposite, storage modulus

1. Department of Mechanical Engineering, Technical and Vocational University (TVU), Tehran, Iran

A closer look on the clinical profile and current challenges of thoracic empyema: A report based on 60 case series

Noor Abbas Hummadi Fayadh[1], Abbas Jaafar Khaleel Al-Anbari[2], Bassam Maddah H. Al-Alosi[3]

Abstract

Background: To provide the reader, the thoracic surgeon, on the current diagnosis and required treatments for adults with empyema thoracis by examining its clinical profile, causative agents, therapy, and overall treatment result.

Methodology: The study included 60 patients with empyema thoracis who underwent tube thoracostomy in 2022 and were aged 60.8±15.6 years. Clinical history that was in-depth, a physical exam, relevant procedures, and a targeted investigation were completed. Gram staining, cytology, microscopy, pleural fluid culture, and antibiotic sensitivity profiles were all used to analyze the pleural fluid. Depending on the culture and sensitivity pattern, all patients had tube thoracostomy and antibiotic therapy. There were complications noted.

Results: Among the 60 patients included in this study, 45 patients were males. The clinical presentation was mainly a febrile syndrome or dyspnea (100%), and 90% or more presented with cough and rigor. More than 80% suffered anorexia or sputum hypersecretion. According to a bacterial analysis, staphylococcus aureus is the most common etiologic agent (26.7%), followed by Streptococcus pneumonia (21.7), and Mycobacterium Tuberculous (20%); isolated from pleural aspirate culture. Diabetes mellitus, uremia, and COPD were the commonest concomitant comorbidities. All study patients were managed with intravenous antibiotics and thoracotomy draining of the empyema. The overall mortality rate of the current study was

1. Department of Surgery, College of Medicine, Al-Nahrain University, Baghdad, Iraq.
2. Cardiovascular and Thoracic Surgery, Department of Surgery, College of Medicine, Al-Nahrain University, Iraq.
3. Cardiovascular and Thoracic Surgery, Department of Surgery, College of Medicine, Al-Nahrain University, Iraq.
*Corresponding Author
Ass. Prof., Consultant cardiovascular and thoracic surgery.
Orcid: 0000-0003-6048

5%.

Conclusion: The occurrence of empyema thoracis is extremely high in developing nations, including Iraq. Lung empyema is a challenging, potentially lethal illness that needs to be promptly diagnosed and treated appropriately to maximize patient outcomes. However, there haven't been any sizable randomized controlled studies for the surgical treatment of empyema, and more study is anticipated.

Keywords: tube thoracostomy, empyema thoracis, a chest tube.

The role of NPK nanofertilizer and Apitizer with urea in the growth characteristics of three cultivars of maize

Wameedh Majid Ali Al-Mafrajee[1], Faiz Abdul Wahid Hamoud El-Rubaee[2]

Abstract

To study the role of spraying different combinations of NPK nano fertilizer and organic fertilizer Appetizer with urea fertilizer on the growth of three synthetic varieties of yellow corn, A field experiment was carried out during the fall season 2022 at the Agricultural Research Station of the College of Agriculture - Wasit University / Al-Kut, on sandy mixture soil, using the RCBD design, with a split-plate arrangement, with three replications. The main panels included three synthetic varieties of yellow corn Fajr1, Soumrob and Baghdad3, while the secondary panels included five fertilizer treatments in which mineral fertilizer (urea) 46% nitrogen was used in the full recommendation (300 kg/ha^{-1}) (control treatment) and symbolized by T1 and the addition of urea according to the recommendation With the addition of Appetizer organic fertilizer in two batches before flowering and full flowering, coded by T2, and the addition of urea according to the recommendation with NPK nanoparticles in two batches before flowering and full flowering, coded by T3, and reducing the treatment of the recommendation in the first and second batches, with the addition of Appetizer organic fertilizer in two batches before flowering and full flowering, code It has the symbol T4 and the reduction of the recommendation treatment in the first and second batches with the addition of nano NPK in two batches before flowering and full flowering and its symbol is T5.

The results showed that there were significant differences between the different fertilization treatments, as the T5 nanofertilization treatment achieved the highest average in most of the growth indicators, and gave the highest average number of days from sowing up to 75% male flowering reached 68.00 days and the highest average number of days

1. Researcher Lecturer PhD Depart. of Field Crops - Wasit Univ - Depart. of Field Crops - Baghdad Univ -Coll. of Agric Coll. of Agric.
2. Researcher Lecturer PhD Depart. of Field Crops - Wasit Univ - Depart. of Field Crops - Baghdad Univ -Coll. of Agric Coll. of Agric.

from sowing up to 75% female flowering reached 68.00 days. 73.44 days and the highest plant height (172.96 cm), ear height (70.01 cm), number of leaves per plant (15.23), and chlorophyll content per leaf under the ear (60.09). The results also showed that the Baghdad3 cultivar excelled in most of the yield indicators and gave the highest average number of days from cultivation up to 75%, male flowering amounted to 66.07 days, the highest average number of days from cultivation up to 75% female flowering amounted to 72.00 days, and the highest plant height (170.04 cm) and cob height. (67.11 cm), the number of leaves in the plant (14.26), and the chlorophyll content of the leaf under the ear (55.49). compared to other varieties. The interaction between fertilization plants and cultivars was insignificant for most yield traits.

Keywords: yellow corn. Synthetic items. Appetizer emulsion. NPK nanoparticles

Generalized Kernel Nano operator open and close in Nano topological spaces

Nabila I. Aziz [1] and Siham I. Aziz[2]

Abstract

The aim of this paper is to define a new class of operators in Nano topological spaces called Kernel Nano operator open and Kernel Nano operator close (briefly , ($\widehat{\mathbb{N}}$ (A) and $\breve{\mathbb{N}}$ (A)) , proved properties and theorems in Nano topological spaces.

Subject Classification: 54A05, 54A ١٠

Keywords: Kernel Nano operator open $\widehat{\mathbb{N}}$ (A) and Kernel Nano operator close $\breve{\mathbb{N}}$ (A)

1. University of Tikrit Department of Physics, College of Education Tuzkhurmatu Iraq
2. Ministry of Education General Directorate of Kirkuk Province Education

Measurement of the concentration of radon gas in a group of drugs used as treatment by nuclear trace detectors (LR-115)

Ali Mahdi Abdul Hussein[1]

Abstract

This study has dealt with determining the concentration of radon gas in (12) local and imported drug samples from Egypt, India and China, which are commonly used by patients such as (PARACETAMOL), (FURAFLU), (ANA-FLAGYL FORTE) and (ACAFLEX).) and CEFEX after collecting samples and preparing them appropriately for experimental measurement, as these samples were collected from private stores in Missan Governorate. In this study, the method of long-term measurement of alpha particle emission was adopted and the number of nuclear effects resulting from these particles was calculated using solid nuclear trace detectors known commercially as (LR-115), as they were used with dimensions (1×1 cm2) for an irradiation period of (65) days as a recommended period. The closed cylinder method was used to measure the concentration of radon gas for pharmaceutical samples. The reagents were collected and treated chemically. From the results obtained in this study, we found that the highest concentration of radon was in the local drug sample (ANA-FLAGYL FORTE), where the concentration reached (1.027 Bq.m- 3) Followed by the local drug sample (ACAFLEX), where the concentration was (0.771 Bq.m-3), while the two imported drug samples (NORGESIC, PONSTRAN) from Egypt and India, the average concentration was (0.458 Bq.m-3), while the lowest concentration was In the two local drug samples (FURAFLU ISORDIN,) where the concentration rate reached (Bq.m-3 0.079), which is a very low percentage compared to all previous samples.

This study provided us with a database about the concentration of radon in some local and imported medical models that are used as medical treatment by patients in Missan Governorate.

Keywords: radon concentration, trace reagents (LR-115), medicines, radon gas

1. Department of Science, College of Basic Education, Misan University, Amarah, Iraq

Antibacterial Effects of Biosynthesized Magnesium Oxide (MgO) Nanoparticles Produced by *Escherichiae coli*

Frial Gemeel Abd*, Azhar Althahab, Anmar M. K. Al-Maamori[1]

Abstract

The world problem in medical is multidrug resistance, So all researchers tend to investigate alternative antibacterial materials example nanoparticles

The MgO nanoparticles synthesis by using the bacteria was the aimed of this research. survey the ability of some bacteria collected from Advance Microbial Lab (6 *E.coli* , 3 isolate *Pseudomonas aerogenosa* and 3 isolates *Klebsiella Pneumoniae*). The *E.coli* was chosen to this research .A 0.1 M magnesium nitrate $Mg(NO_3)_2.6H_2O$ was added to *E.coli* culture broth at 37°C in a dark place in shaker water bath . After 24 hours, the reaction mixture was dropped-wise with 2M NaOH solution to achieve a pH 10. After adding the alkaline solution, a Mg $(OH)_2$ solution was formulated and left for 2 hours before the color changed to a brown color, then chaeacterization of MgO NPs by, UV-Visible spectroscopy wave line at(405-630), Fourier transforms infrared spectroscopy (FTIR), X-ray diffraction analysis (XRD), finally, scanning electron microscopy.The results of scanning electron microscopy found the diameter of nano was 31-35 nanometer .the MgO nanoparticles had antibacterial effect on Gram negative and gram positive bacteria .

1. Department of Biology – Microbiology- College of Science - University of Babylon , Iraq.

Improvement the electronic Properties of armchair Graphene Nanoribbon with F, Cu, Ag, Na, K and Carbon Chain Edge using density functional theory method

Abdulrasool AL-Taher and Abdulkareem Mahdi

Abstract

The focusing of this study is on the important electronic properties of graphene nanoribbons especially on the energy band gap and density of states, electronic density distribution (Homo and Lumo), and IR test. This study for AGNR in its pure state consists of hexagonal carbon cell with flour passivation edge and that is a natural state , then changes the edge (FPE) doping with atoms of [Cu, Ag] and [Na , K] and study for ANGR in pristine state consist of [4,6,8,10,12,14,16,18,20] carbon cell number with flour passivation edge. The Q.M. is used in the study treatment by using density of state DFT and program 09 Gaussian. The study shows that the dependence of all electronic properties on the Number of Hexagonal cell / odd or even number where if odd or even number, where is odd number the exponential curve of the energy gap is splitting over that exponential curve from even number. The adding chain effect on the electronic properties has an odd number of carbon atom. At last all these additions give the possibility to control the AGNR from conductor depending on the addition type and atomic chain number energy range between 2.272eV to 3.65eV. Approximately as shown in the tables.
Keywords: Armchair Graphene Nano ribbon, DFT density functional theory, Energy gap, HOMO and LUMO, IR Spectrum, Density of state

Introducing nano technology and examining the differences in the nano world

Amir mohammad Bahrami maddah[1*], Yavar ahmadi[2], Mihammad Salehi Avval[3]

Abstract

Nano is originally a Greek word and means dwarf and short. A nanometer is a unit of measurement equal to 9-10 meters, and all objects and beings whose size is between 1 and 100 nanometers are called nanoscale. In fact, nanotechnology is the understanding and application of new properties of materials and systems in these dimensions, which show new physical effects that are mainly influenced by the dominance of quantum properties over classical properties. Material properties are divided into two parts: physical properties and chemical properties. Experience has shown that the properties of a pure substance are reasonably constant, and this allows us to identify substances by their properties. But scientists' findings show that a nanometer-sized material will have different properties than its larger particles. This is despite the fact that shrinking the particles is a physical change and we expect that with this physical change, the main properties of the material will not change. This article introduces nano technology and examines the differences in the nano world.

Keywords: nanotechnology, nanotechnology differences, chemical properties, physical properties.

1. Master student of chemistry, Farhangian University, Tabriz, Iran
2. Department of Basic Sciences, Farhangian University, Tabriz, Iran
3. Master student of chemistry, Farhangian University, Tabriz, Iran

Optimization of encapsulation efficiency in liposomal nanocarriers production containing garlic essential oil (Allium sativum)

Salar Ali Ahmed[1], Mahmoud Salim Fazil[2], Hamed Hassanzadeh[3*]

Abstract

This study is aimed to optimize the preparation factors such as sonication time (5-20 minutes), cholesterol to lecetin ratio (CHLR) (0.2-0.8) and essential oil content (0.1-0.3 g/100 g) in solvent evaporation method for formulation of liposomal nanocarriers containing garlic essential oil (GEO) in order to find the highest encapsulation efficiency and stability with strongest antioxidant capacity and antimicrobial activity. Droplet size, zeta potential and encapsulation efficiency were measured for all prepared samples of nanoliposome based on the experimental design. Sonication time is recognized as the most effective factor on the droplet size, zeta potential, encapsulation efficiency while CHLR was the most effective factor on zeta potential. The overall optimum condition was determined by response surface methodology (RSM) as the predicted values of the studied factors (sonication time: 18.99 minutes, CHLR: 0.59 and content of GEO: 0.3 g/100 g) considering all responses including the highest encapsulation efficiency.

Keywords: Liposomal nanocarriers, Droplet size, Garlic essential oil, Solvent evaporation method, Optimization

1. Department of Food Technology, Faculty of agricultural engineering science, Salahaddin University-Erbil, Erbil, Iraq
2. Department of Food Technology, Faculty of agricultural engineering science, Salahaddin University-Erbil, Erbil, Iraq
3. Department of Food Science and Hygiene, Faculty of Para-Veterinary, Ilam University, Ilam, Iran

MOF-derived carbons for environmental applications in Photocatalytic degradation of contaminants from aqueous solution. A mini review

Mohammad sina mohtaram[*], Fatemeh farahi[1]

Abstract

MOFs are a type of porous material that exhibits high structural stability due to the strong and reversible coordination bonds between metal ions or clusters and organic ligands. Nevertheless, many MOFs are not particularly stable, which hinders their application for the remediation of environmental contaminants. Recent researches have shown that carbons derived from metal-organic frameworks maintain their initial structural and morphological characteristics, in addition to displaying remarkable stability in aqueous environments. The utilization of carbon materials derived from MOFs holds considerable promise in terms of their performance as adsorbents and catalysts, given their multitude of advantages. In this essay, we outline the properties of MOF-derived carbon, and provide an overview of the synthesis procedures used to generate MOF derived, such as direct carbonization, and Post-processing of MOFs. finally, investigate their practical applications in the field of photocatalytic and advanced oxidative degradation of environmental contaminants.

Keywords: Metal-organic frameworks, MOF derived carbons, photocatalysis, catalytic degradation

1. **Master student of chemical engineering, Faculty of Advanced Technologies, Shiraz University, Shiraz, Iran**

Thermochemistry and misconception related to its teaching

Mohammad Salehi avval*, Amirmohammad Bahramimaddah[1]

Abstract

The purpose of the present study is to investigate students' understanding of the concept of heat and temperature. Concepts that are very important in school curriculum. This concept is one of the concepts related to daily life that forms the basis of physics, chemistry and biology, and in most curricula, it is suggested to learn it from the very first basics of the elementary school. The present article showed that the students of different levels of elementary, middle school (guidance) and middle school (high school) all have a misconception in the topics of heat and thermochemistry. Conceptual understanding of heat and temperature and the difference between these two is a problem that is seen by some students, but applying it and relating it to different quantities such as mass and temperature is a problem that is more comprehensive than the previous problem. The educational planners of the country should benefit from the researches of researchers in the field of educational content and identification of misconception. Teachers, by conducting continuous formative evaluations, inquiring about initial ideas and paying attention and correcting them during teaching, are among the factors that can help neutralize misconception in the early stages and fix them.

Keywords: Thermochemistry, Misconception, Chemistry Education, Physical Chemistry.

1. Bachelor student of Chemistry Education, Farhangian University, Allameh Amini Campus, Tabriz, Iran.

Shape Memory Polymers and Their Nanocomposites in Biomedical Engineering

Mohammad Hossein Latifi, Zahra Mohammadi*1

Abstract

Shape memory polymers (SMPs) and their nanocomposites as a significant type of smart materials have attracted the attention of many researchers in recent decades due to their promising applications in fields such as biomedicine, aerospace, smart textiles, and robotics. SMPs are capable of reversible deformation under various external stimuli like heat, electric/magnetic fields, pH, etc. This capability, along with the good biocompatibility of polymers and the biodegradability of some polymers has gained great potential for use in many biomedical applications such as tissue engineering scaffolds, drug-eluting stents, self-tightening sutures, and drug delivery systems. Also, the shape-memory property of SMPs allows medical devices to be folded into minimal volume, which makes them easily implanted in the body and recover their original shape. A brief review of the classification, architecture, mechanism of action, and design considerations of these SMPs is presented in this paper, followed by a discussion of recent studies on their use in biomedical applications.

Keywords: Shape memory polymers, Smart polymer nanocomposites, Biomedical applications, Shape-memory property

1. Bioceramic and Implant Laboratory, Faculty of New Sciences and Technologies, University of Tehran, Tehran, Iran

Industrial Thermal Energy Sources And Their Important In The World

Mohammed Dinar Saihood AL_Moussawi[1] , Mousa Farhadi,[2] Omid Jahanian[3]

Abstract

Thermal energy storage (TES) is a method that saves thermal energy by temperature control a storage medium so that it may subsequently be utilised for heating and cooling as well as power generation. In industrial operations, TES systems are extensively employed. By utilising flexible technologies such as energy storage, energy system operators can balance supply and demand for energy. This helps to construct and operate energy systems that are more reliable, adaptable, and cost-effective. TES can help with the smart combination of the power, heating, and cooling sectors, which helps both power and thermal systems. TES technologies play a key part in the electricity sector, but their full potential has yet to be realised. More innovation is necessary to boost the commercial readiness of TES technology. This review focuses on TES advanced technology, which offer a technique of storing thermal energy in a number of industrial applications .

1. Republic of Iraq , Ministry of Oil , Renewable Energy Department , Waset , Iraq
Department of Thermofluids , Faculty of Mechanical Engineering , Babol Noshirvani University of Technology , Babol , Iran
2. Department of Thermofluids , Faculty of Mechanical Engineering , Babol Noshirvani University of Technology , Babol , Iran
3. Department of Thermofluids , Faculty of Mechanical Engineering , Babol Noshirvani University of Technology , Babol , Iran

Antigenic markers of *T. gondii* for chronic forms of toxoplasmosis in fertility age women .

Suha A. AL-Fakhar[1], Wifaq M. Ali[2], Saad Hasan Mohammed Ali[3] ,Khalil Ismail A Mohammed[4], Jinan M. Mousa[5], Zahraa Mushtag[6], Nada Nuri Yunis[7]

Abstract

Background: *Toxoplasma gondii* is a parasitic protozoan which is the cause of toxoplasmosis. Although human toxoplasmosis in healthy adults is usually asymptomatic, serious disease can occur in the case of congenital infections and immunocompromised individuals. Currently, routine diagnosis of toxoplasmosis relies mainly on the use of various serological tests to detect specific antibodies in the serum samples of infected patients. while, recombinant antigens could enhance the clinical usefulness of avidity assays in order to determine more accurately when *T. gondii* infection occurred.

Material and Methods : Forty (40)fertile aged women (18-37years) with history of abortion and had positive results of IgG Abs by minividus form October 2021 to April 2022 ,Kit of *recom*Line Toxoplasma IgG Avidity form Mikrogen /Germany,item No.11010, was used ,which is a qualitative *in vitro* test for the determination the avidity of IgG antibodies against *Toxoplasma gondii* in human serum or plasma.

Results: Phase II of toxoplasmosis was positive of antibodies against different antigens detected by *recom*Line assay, no other significant relation was observed. Also, that there was no significant

1. Clinical Communicable Diseases Research Unit, College of Medicine, University of Baghdad.
2. Clinical Communicable Diseases Research Unit, College of Medicine, University of Baghdad.
3. Clinical Communicable Diseases Research Unit, College of Medicine, University of Baghdad.
4. Clinical Communicable Diseases Research Unit, College of Medicine, University of Baghdad.
5. Clinical Communicable Diseases Research Unit, College of Medicine, University of Baghdad.
6. Central Public Health, Ministry of Health, Baghdad-Iraq.
7. Central Public Health, Ministry of Health, Baghdad-Iraq.

relation between the period of infection and avidity of IgG –Abs against different antigens of *T.gondii* detected by *recom*Line test. In addition The results showed that there was a significant relation between of the number of abortions to GRA1-antigen (P=0.012) and SAG1-antigen (P=0.003) .

Conclusion: There was a significant relation between of the number of abortions to GRA1 and SAG1-antigens detected by *recom*Line assay ,where increase in the positive results with the increase in the number of abortions.

Anti-bacterial Activity of Some New Heterocyclic Compounds Containing A moiety of Imidazolodine and Oxazepine Derivatives

Hassan Sh. Kahait [1]

Abstract

This study includes preparing the new Azo compound (A) Dissolved of 4-fluoroaniline in a mixture of Sodium nitrite ,concentrated hydrochloric acid and 4-hydroxyacetophenone then preparing the Schiff base (B) By reacting the prepared Azo and 2-aminoanthraquinone By adding drops of icy acetic acid,via microwave, the Synthesis of Imidazolidine (B_1-B_2) by Schiff base (B) reaction with amino acids Lucien and Tyrosine respectively, Schiff base (B) interact with Maleic Anhydride , Phthalic Anhydride to form the seven - rings of Oxazepane (B_3) , Benzoxazepene (B_4) , respectively.

Ease and speed of microwave use and has a high yield compared to sublimation. The prepared compounds (Schiff bases, imidazolidine and Oxazepine derivatives) are not affected by ambient conditions such as temperature and light, and this indicates their high stability as well as their high boiling points. The reaction conditions must be maintained (temperature and pH of the solution), and the time periods for preparing the compounds vary according to the push and pull groups, as the pull groups reduce the time period for the reaction to occur, and the driving aggregates increase the reaction speed, for most of the prepared compounds have a biological effect.

The (TLC) technique were used to follow the reaction , iodine was used as a moderator, the melting Points measurement, The infrared (FT-IR) spectra and The spectra of Proton NMR (^{1}H NMR) .

Key Word: Azo dyes, Schiff base , Imidazolodine and oxazepine .

1. Ministry of Education / Najaf Director / Iraq

Synthesis and identification of some organic nanocomposites of graphene oxide, ferrous, ferric and zinc oxide, and study of their antibacterial and antifungal activity

Saba S. Abdulghani [1*], Malath Khalaf Rasheed[2]

Abstract

In this study, many nanocomposites of graphene, ferrous, ferric and zinc oxide nanocomposites were prepared using 2-aminobenzothiazole derivatives, benzimidazole, oxazolidine-4-en, thiazolidine-4-en, imidazolidine-4-en and imidazothiazole. 2-Aminobenzothiazole derivatives were obtained by reaction of pharmacological amines with potassium thiocyanates in the presence of bromine using the conventional method. As for the benzoimidazole derivatives was synthesis from orthophenylene diamine with different pharmacological carboxylic acids in the presence of ammonium chloride as a catalyst, using the microwave irradiation method. The five-cyclic derivatives oxazolidine-4-one, thiazolidine-4-one, imidazolidine-4-one were prepared from the reaction of Schiff bases derived from 2-aminobenzothiazole compounds prepared with each of gluconic acid, thioacetic acid and alanine using microwaves, while the imidazolidine derivatives were prepared from the reaction 2-Aminobenzothiazole derivatives prepared with chloroaacetic acid in absolute ethanol and using microwave as well. The second step was synthesis of the nano-oxides of graphene, ferrous, ferric and zinc with the organic derivatives prepared above. The effect of some nanocompounds on the growth of a fungus of the yeast type Candida was used and bacteria isolates from Gram-positive bacteria, *Staphylococcus aureus* and Mycobacterium *leprosy bacillus*. Gram-negative bacteria, *Shigellosis* and *Pseudomonas*, were used using the standard antifungal Nystatin, Dapsone. efficacy of bacteria. The results indicate that the nanocomposites have the ability to inhibit the fungi and bacteria used.

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1. Department of Chemistry, College of Education, University of Samarra, Samarra, Iraq
2. Department of Chemistry, College of Education, University of Samarra, Samarra, Iraq

The Role silver Nanoparticles of *Arirthrospira platensis* In Some Biofilm Bacteria

Prof.Dr.Sheimmaa J. Hadi[1], Dr.Ahmed A. Madhloom[2] ,Shaymaa A. Abbas[3], Dr.Melath K. Farhood[4]

Abstract

Arirthrospira platensis was conducted at the University of Kufa, Faculity of Science / from November 2021 to February 2022. Diagnosed bacteria are obtained from Al-Amin Research Center And advanced biotechnology in the holy city of Najaf which Include: *Escherichia coli* and *pseudomonas eroginosa* to evaluate the antibacterial activity of three concentrations (100 ,150, 200) mg/ml each extract in three replicates by spreading fine agar method.The atomic force microscope(AFM) was used to obtain the three dimensional structure and the average diameter , the silver nanoparticles of *A. platensis* was have average diameter 2.07 Biosynthesized silver nanoparticles showed antibacterial activity the current study bacteria .

1. Dept.Biology / Faculty Of Science / University of Kufa
2. Dept.Biology / Faculty Of Science / University of Kufa
3. Directorate,Najaf-Iraq,Ministry of education,Iraq
4. Directorate,Najaf-Iraq,Ministry of education,Iraq

The association of IL-6 levels , AMH and vitamin D receptor BsmI (rs 1544410) polymorphism in Iraqi women with polycystic ovarian syndrome patients

Waleed Khalid Ahmed[1] *, Hameed Hussein Ali[2] & Mohammad Mahmoud Farhan Al-Halbosiy [3]

Abstract

This study compared the variations in some clinical parameters between patients with Polycystic ovary syndrome and controls, Additionally, genotyping for vitamin D receptor *BsmI rs (1544410) polymorphism*. **Results:** Results showed that the genotyping frequency varied between study groups. with the AA genotype ratio in both PCOS patients and controls serving as a reference. There were significant differences between study groups at (p = 0.04) , and the GG genotype ratio was higher in polycystic ovary syndrome patients than in healthy group. An OR > 1 (OR = 5.5) with a 95% confidence interval (1.0 - 28.1) implies a genotype pattern that increases the risk factor for PCOS. While the AG genotype in PCOS had an OR of 4.4 when compared to the control group, there is no statistically significant difference between PCOS and controls (P = 0.08), with 95% confidence ranges (0.8 - 23.2), results of allele frequency for discovered G demonstrated that results between PCOS and normal control were extremely significant, with a p value of (p=0.002). When the odds ratio (OR=4.4) for allele G is greater than 1, the allele T is considered a risk allele (risk factor).

Methods:

Twenty-six patients 38 women diagnosed with polycystic ovary syndrome and thirty-eight healthy women were enrolled in the study. The research period was from December 2021 to May 2022. After 10-12 hours of fasting, 5ml of blood was collected from patients and the control group. Two aliquots of blood were taken out. For DNA extraction, the initial aliquot (2 ml) was put into an EDTA tube. the second aliquot (3ml) of separated serum was used to test AMH and IL-6 levels.

Keywords: Vitamin D receptor, AMH, IL-6, Bsm1, PCOS.

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1. COSQC, Ministry of Plaining, Baghdad, Iraq.
2. Department of Chemistry, College of science, University Of Anbar, Al-Anbar, Iraq.
3. Biotechnology Research Center, Al-Nahrain University, Iraq

Studying SOD2 gene polymorphism in syphilis patients in the Babylon province of Iraq

Tsahel H amid[1], Nisreen kaddim Radi[2], zahraa isam jameel [3]

Abstract

Treponema pallidum causes sexual syphilis because it has the potential to travel into the bloodstream and infect many tissues. Many diseases have a free radical concept in which reactive oxygen species. (ROS) play a big role in the development of cell damage. In accordance with the band found in the SOD2 gene, which comprised three to four bands, the PCR-SSCP results for the SOD2 gene indicated two unique haplotypes.While these haplotypes were found in two groups: syphilis patients and controls, When compared to a control group, the results show that there is a link between three and four bands in patients. Significant differences resulted from the patients' groups having higher rates of SOD versus the control groups. ($P \leq 0.05$)

The Conclusion of research :-

PCR-SSCP Is a suitable screening approach for detecting SOD2 gene in treponema pallidum infected patients.

Key wards:- Antioxidant, SOD2, Treponema pallidum, Oxidative, SSCP, PCR .

1. University of Babylon, College of Science for Women, Department of Biology, Iraq
2. University of Babylon, College of Science for Women, Department of Biology, Iraq
3. Islamic university , Babylon campus, Iraq.

Estimation of Interleukin 6 in Covid-19 vaccinated persons

Zainab A. Tolaifeh[1], Hawara Sabah Al-Musawi[2] and Israa A. Ibraheam[3]

Abstract

This study was conducted in Babylon governorate, Samples were collected during the period from 29/11/2021 to 7/1/2022 on patients recovering from Covid-19. This study included collecting blood samples from 30 patients who recovered from Covid-19 and from 22 non vaccinated people as a control group in different age groups. The results of the demographic study of the control groups and the group of patients recovering from Covid-19 showed age group (19-29) years have the highest percentage of infection reaching (80.7%). As for gender, the percentage of infected females (73,1%) was higher than infected males (26.9%). When IL-6 was investigated by ELISA test, the concentration was higher in Covid-19 patients with than that in the healthy control group; the mean± SE of serum level of IL-6 in Covid-19 patients and control group was464.74 ±40.6 and 218.05 ±21.24pg /ml respectively. IL-6 concentrations in females were higher than males.

1. University of Babylon, College of Science for Women, Department of Biology
2. University of Babylon, College of Science for Women, Department of Biology
3. University of Babylon, College of Science for Women, Department of Biology

Prevalence of Enterotoxin (*Sea* to *See*) in Ocular *Staphylococcus aureus* by polymerase chain reaction (PCR) assay.

Assist. Prof. Farah Tareq Al-Alaq [1]., Prof.Anwar Kadhim Hussein AL-saffar [2].And Safaa Jassim Flaifel Muhaisin [3].

Abstract

Objectives: This study aimed to investigate some of enterotoxin profile among Staphylococcus aureus isolated from patients with eye infections by PCR-based investigation.

Methods and Materials: 160 eye swabs specimens were collected from iraq hospitals, including Ibn Al-Haitham Teaching Eye Hospital in Baghdad, Al-Imam Al-Sadiq Hospital and Hilla Teaching Hospital in Babylon. Distributed according to types of ocular infections 119 Conjunctivitis 32 Blepharitis (Eyelids Infection) 7 Keratitis 2 Dacryocystitis. These samples were collected between November 2021 and March 2022. *S. aureus* isolates were identified by inoculated on manitol salt agar, blood agar for primary screening of *Staphylococcus spp*. and then confirmed by biochemical tests and Vitek2 Compact System, and by specific primer for 16S rDNA gene of *Staphylococcus spp*.

Results: Among the culture-positive growth consist of 57 (41.007%) bacterial isolates of *staphylococcus aureus*. PCR has been used to investigate enterotoxins genes and the PCR results showed that (40%,75%, 67%, 61% and 32%) of isolates have Sea gene, *Seb* gene, *Sec* gene, *Sed* gene and See gene respectively.

Key words: *Staphylococcus aureus,* enterotoxin, ocular infections

1. Department of Biology, College of Science, University of Babylon, Iraq
2. Department of Biology, College of Science, University of Babylon, Iraq
3. Department of Biology, College of Science, University of Babylon, Iraq

Safety of Nanotechnology in Food Industries

Mahdi Ataeian Tavana[1]

Abstract

The arrival of nanotechnology in various industries has been so rapid and widespread because of its wide-ranging applications in our daily lives. Nutrition and food service is one of the biggest industries to be affected by nanotechnology in all areas, changing even the nature of food itself. Whether it's farming, food packaging, or the prevention of microbial contamination the major food industries have seen dramatic changes because of nanotechnology. Different nanomaterials such as nanopowders, nanotubes, nano-fibers, quantum dots, and metal and metal-oxide nanoparticles are globally produced in large quantities due to their broad applicability in food-related industries. Because of the unique properties of nanostructures and nanomaterials – such as a large surface area, high activity, and small size, there is some concern about the potential for harmful adverse effects of used nanomaterials on health or the environment. However, because of tremendous advances in different industries, this concern may be unnecessary. This paper presents some uses of nanomaterials in food and related industries and their possible sideeffects. This review covers the various aspects of nanomaterials and their impact on human exposure, safety, and environmental concern.

1. Masters Student in chemical engeneering, imam Hossein university

Investigating the antioxidant and antibacterial properties of ZnO nanoparticles coated with chondroitin sulfate against *Staphylococcus Aureus*

Zeinab Daryadel[1], Razieh Jalal[2]

Abstract

Staphylococcus aureus (*S. aureus*) is considered as common pathogenic bacteria with antibiotic resistance properties [1-3]. Currently, nanomedicines have been suggested to deal with antibiotic resistance [4, 5]. Zinc oxide nanoparticles (ZnO-NPs) have chemical and thermal stability, high biocompatibility, antioxidant, and antibacterial activity [6]. Coating surface of ZnO-NPs with different biomolecules have been proposed to improve their cytotoxic activity [7, 8]. In this study, the antioxidant property of ZnO-NPs coated with chondroitin sulfate (CS) mediated by cysteine (ZnO@Cys@CS) and their antibacterial activity on standard *S. aureus* and clinical methicillin-resistant *S. aureus* (MRSA) strains were investigated. For this purpose, the surface of synthesized ZnO-NPs by thermal solvent method was coated with cysteine (Cys) and CS. ZnO@Cys@CS-NPs were characterized by XRD, FT-IR, zeta potential, and DLS. Antibacterial activity of ZnO-NPs and ZnO@Cys@CS-NPs against the standard strain showed MIC values of 250 and 500 μg/mL, respectively. The MIC value for both nanoparticles against the MRSA strain was the same and equal to 250 μg/mL. The MBC of both nanoparticles for the tested strains was determined to be more than 1000 μg/mL. The results of DPPH and superoxide free radical inhibition assays showed higher antioxidant property of ZnO@Cys@CS-NPs than ZnO-NPs. Both nanoparticles at MIC were able to inhibit biofilm formation by both strains, While, ZnO@Cys@CS-NPs at 1/2 x MIC and 1/4 x MIC concentrations showed more antibiofilm activity by the standard strain as compared

1. Department of Chemistry, Faculty of Science, Ferdowsi University of Mashhad, Mashhad, Iran
2. Department of Chemistry, Faculty of Science, Ferdowsi University of Mashhad, Mashhad, Iran
Novel Diagnostics and Therapeutics Research Group, Institute of Biotechnology, Ferdowsi University of Mashhad, Iran

to MRSA. In conclusion, surface modification of ZnO-NPs by CS-coating seem to increase its antioxidant activity without improving its antibacterial activity against both standard and MRSA bacteria.

Keywords: *Staphylococcus aureus*, ZnO nanoparticles, chondroitin sulfate, antioxidant activity, antibacterial activity.

Use of $FeNi_3$ / DFNS / Ru (II) magnetic nanocatalyst in CO_2 gas absorption

Nasrin Haftabady, Raheleh Zhiani, Malihesadat Hosseiny

Abstract

In our era, a lot of energy is produced from fossil fuels. This issue leads to an increase in the emission of carbon dioxide in the atmosphere, in addition, it increases the greenhouse effect. Our focus is on the absorption, storage and use of carbon dioxide. Recently, green chemistry has attracted a lot of attention in terms of overcoming greenhouse gases, a gas that the world's population faces. To solve this problem, CO_2 gas can be used as a safe, cheap and It can be reused that in this article, we produced $FeNi_3$ / DFNS / Ru (II) magnetic catalyst according to the reported methods, and then using $FeNi_3$ / DFNS / Ru (II) complexes, we obtained a suitable catalytic activity. Regarding the reduction of carbon dioxide gas, they demonstrated the formation using visible light radiation. We analyzed its characteristics using scanning electron microscope (SEM), transmission electron microscope (TEM), and infrared spectroscopy (FT-IR). High catalytic activity, as well as the possibility of regeneration and reuse and reproducibility of the catalyst, without any significant loss in catalytic activity after the completion of the reaction, can be mentioned. $FeNi_3$ / DFNS / Ru (II) complexes showed a suitable catalytic activity regarding the reaction in an environmentally compatible aqueous environment in order to reduce carbon dioxide. This material is effective in the direct chemical stabilization of carbon dioxide coming out of the industrial chimney and provides high levels of absorption and conversion of carbon dioxide.

Synthesis of one-component reaction of 2-nitroaniline in the presence of $FeNi_3/SiO_2$/DFNS/PEI/Pd magnetic nanocatalyst

Nasrin Haftabady, Raheleh Zhiani, Malihesadat Hosseiny

Abstract

Water is a vital resource to support human life, which can be exploited by humans more than any other resource for the essence of life. As a result, water pollution has been raised as one of the most important environmental problems in this modern era. Indiscriminate use of available resources by humans ultimately causes the destruction and pollution of drinking water sources such as rivers, lakes, wells and natural springs, which forces investment for water purification. have done 4-nitrophenol compounds are very toxic. The aim is to convert 2-nitrophenol to 2-aminophenol, which is not toxic and can be used in industries, which turns a waste product into a valuable product. In this research, we used FeNi3/SiO2/DFNS/PEI/Pd magnetic nanocatalyst. These nanoparticles were synthesized and analyzed by (AFM), (SEM), and (TEM) and the synthesized nanoparticles were confirmed. Reduction of 4-nitrophenol compounds to 4-aminophenol was investigated by UV-Vis, which leads to red color transition from 400 nm to 300 nm. The peak intensity of 4-nitrophenol decreases from a maximum of 400 nm and the intensity of the peak of 4-aminophenol increases to a maximum of 300 nm simultaneously using 20 mg of nanocatalysts and 2 mm of NaBH4, which converts 97% in just 2 minutes. occurred and the effect of different water conditions in the reduction of aromatic nitro compounds was also studied using both nanocatalysts, and water was the best solvent. In addition, $FeNi_3/SiO_2$/DFNS/PEI/Pd can be recycled by magnetization and easily separated from the solution and reused ten times.

Application of polymer nano fibers in sound absorption

ImanSetayeshfar*[1] , Sanaz Abbasi Nataj[2], Fardin Abedi[3]

Abstract

Porous materials such as textiles and foams, due to the presence of small air pockets inside them, can prevent sound reflection from surfaces, as well as disperse sound energy and convert it into heat energy, and dampen the sound wave. In general, fiber sound absorbers have good sound absorption capabilities at high frequencies, but perform poorly at low frequencies. This feature reduces their use, especially at low frequencies. To improve absorption in this frequency range, we must increase the thickness, so that we have more surface area for absorption. While the increase in thickness is the limiting factor for most industrial applications such as automotive, aerospace and construction industries. One of the ways to improve the absorption property in low frequencies is to use air gaps and perforated plates. Non-textured composites, which make up a large part of the lightweight materials inside the car, have other properties such as shock energy absorption and renewable capability in addition to sound reduction.

Keywords: nanofiber, sound absorber, absorption frequency.

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1. *.Ph.D student of Analytical Chemistry, Shahid Dr. Mohsen Fakhrizadeh Chemical Science and Technology Center, Imam Hossein University (ihu), Tehran, Iran
2. Master's student in Analytical Chemistry, Faculty of Basic Sciences, Yasouj University, Yasouj, Iran
3. Ph.D. student of Analytical Chemistry, Faculty of Basic Sciences, Yasouj University, Yasouj, Iran

A review of the safe innovation of smart nanomaterials used in food industry

Narges Jannatiha[1], Hamid Husseini[2], Maryam Moslehishad[3*]

Abstract

The new European Industrial Strategy for Sustainable Materials launched in October 2020 in the new EU Action Plan is an ambitious plan to achieve a sustainable, fair and inclusive EU economy. In 2023 United Nations Sustainable Development, these policies require that any new material or product must not only be functional and cost-effective, but also safe to ensure compliance with regulations and acceptance by consumers. Nanotechnology is one of the technologies that can make vegetable growth possible. The technologies that can grow more can be mentioned, which is sometimes referred to as the green science of technology, the application of the principles of green chemistry in the design, manufacture, use and end of life of nanomaterials. This paper reviews advanced nanomaterials that actively respond to external stimuli that are also known as smart nanomaterials and are currently on the market or in research for non-medical applications such as agriculture. food packaging, are used. External stimuli may be changes in environmental conditions, making this material smart nanoparticles and active products that may be a challenge due to their complexity and dynamic behavior. should be discussed to assess safety, sustainability and related legal aspects. Existing knowledge and contingencies are discussed regarding safety, sustainability and legal aspects. This review reports some of the several issues that need to be addressed by research and industrial stakeholders to ensure that future smart nanomaterials and their associated functional products are safe, thereby fulfilling their full socio-economic potential. give in the European green agreement in one economy.

Keywords: Smart nanomaterial, Safe, Rules, Nanotechnology

1. Department of Food Sciences and Technology, Ferdowsi University of Mashhad, Mashhad
2. Faculty of Processing, Iran Polymer and Petrochemical Institute, Tehran
3. * Department of Food Science and Technology, Safadasht Branch, Islamic Azad University, Tehran

A review of polymer nanocomposites in food packaging

Narges Jannatiha[1], Naser Sedaghat[2*]

Abstract

Polymers are widely used in industry and our daily life due to their versatile performance, light weight, low cost, excellent chemical stability and processability. However, in some cases such as thermal conductivity, environmental pollution is facing important technological obstacles. Enhancement of mechanical properties, thermal conductivity, biodegradability has become a very attractive research topic.

The special properties of nano polymer materials (size on the nano scale) have made them unique in food packaging. Nano materials can be multifunctional, bioactive in the field of food packaging by creating desirable properties. Synthetic polymers are reinforced with fillers such as carbon nanotubes, carbon fibers, carbon black, graphite, graphene, clay nanoparticles, inorganic nanoparticles, metal and ceramic fillers to form packaging materials with high efficiency and performance. Current interest for the thermal conductivity of polymers is focused on the selective addition of nanofillers with high thermal conductivity. The high thermal conductivity of carbon nanotubes has made them a promising choice for composites with high thermal conductivity. Polymer nanocomposites have significantly improved packaging properties in oxygen permeability, moisture permeability, thermal stability, antimicrobial properties, nonflammability, and mechanical properties. The performance of nanocomposite films depends on how the nanofiller is incorporated into the polymer matrix. The use of suitable polymer, functional nanofiller can represent inspiring paths to create innovative packaging materials with suitable mechanical, thermal and barrier properties. In this article, the role of nanoparticles and fillers in thermal conductivity and improving the properties of polymer nanocomposite packaging films and the application of nanocomposites in food packaging are discussed.

Keywords: Food Packaging, Polymer, Nanocomposite, Thermal Conductivity

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1. Department of Food Sciences and Technology, Ferdowsi University of Mashhad, Mashhad
2. * Department of Food Sciences and Technology, Ferdowsi University of Mashhad, Mashhad

The effects of formulation of nano-encapsulated essential oil of medicinal plant karla (Momordica charantia) on cotton Whitefly (Bemisia tabaci Gennadius)

Razia Biglari Farash[1]

Abstract

The use of nanocapsule technology in environmentally friendly pesticides has led to an increase in the efficiency of these materials. Whitefly is one of the most important economic pests in greenhouse, horticultural and agricultural crops and is a carrier of many viral diseases in these crops. Environmental considerations and moving towards the integrated pest management program make the use of plant materials necessary. Therefore, this experiment was conducted in order to investigate the contact toxicity of the nano-encapsulated essential oil of karla (Momordica charantia) leaves compared to the normal essential oil on the adult Whitefly insect in a completely randomized design Whitefly was collected from educational greenhouse plants. Carla plant leaves were collected from the educational farm of medicinal plants. After preparing the essential oil and its nanoencapsulation process, concentrations of 500, 100, 1500 and 2000 ppm were applied using the leaf disc method under controlled conditions of temperature, light and humidity. Unencapsulated essential oil was used as a control. In the experiment, it was found that the amount of loss increases with the increase in the concentration of the essential oil of the nanocapsule. So that at a concentration of 2000 ppm, the loss rate increased to 100%. Although compared to the non-encapsulated nano-encapsulated essential oil, the difference in the results was not significant, nevertheless, the nano-encapsulated essential oil could show better results at a lower concentration. As a result, karla essential plant nanocapsule as an insecticide in the control of whitefly pest has a high potential for further and supplementary studies.

Key words: plant pesticide, contact toxicity, white balk, nanocapsule

1. Master's student of medicinal plants, Sari University of Agricultural Sciences

Synthesis of cobalt ferrite magnetic nanoparticles in rotating packed bed reactor

Zahra Ghaedi Bardei[1], Mahdieh Abolhasani[2,*] Pouya Mottahedin[3]

Abstract

The purpose of this study is to investigate a simple method for preparing magnetic bimetallic oxide nanoparticles with high production efficiency. Cobalt ferrite ($CoFe_2O_4$) nanoparticles have attracted a lot of attention due to their unique magnetic and chemical properties. In this work, cobalt ferrite nanoparticles were continuously synthesized through a high-gravity reactive precipitation method using a rotating packed bed reactor with a rotation speed of 1700 rpm and an inlet flow rate of 30 liters per hour and with a specific concentration. High-gravity mixing works by subjecting the reactants to centrifugal force in a rotating packed bed during the mixing phase, which greatly increases the rate of mass transfer as well as the intensity of macro- and micro-mixing. The Crystalline size of synthesized nanoparticles through XRD analysis and Scherrer equation was reported 12.2 nm and its specific surface area was $89.7955\ m^2$ /g through BET analysis.

Keywords: Magnetic nanoparticles, Cobalt ferrite, Rotating packed bed reactor, Synthesis

1. Faculty of Chemical, Petroleum and Gas Engineering, Semnan University, Semnan, Iran
2. Faculty of Chemical, Petroleum and Gas Engineering, Semnan University, Semnan, Iran
3. Environmental Research Center, Semnan Provincial Office of the Department of Environment, Semnan, Iran.

Theory and simulation of semi-flexible polymer knots confined in nanospheres and its effects on polymer packing and ejection

Fatemeh Moharaminezhad*, Samaneh Ghanbari-Kashan and Narges Nikoofard [1]

Abstract

Deoxyribonucleic acid is DNA, the hereditary material that is compacted in the cells of the human body and almost all other organisms in the form of genes and chromosomes. When DNA is packaged inside the cell nucleus, it is possible to form complex knots that also depend on the topological or structural friction of DNA. To investigate the dynamics of this limited chain, we can simulate a semi-flexible polymer string enclosed in a nanosphere and investigate the effects of restriction on its packing and ejection, and find the effect of the length and persistence length of the polymer string (DNA) on the number of knots. In this study, using molecular dynamics simulation, the main factors for packing the semi-flexible polymer strand into the nanosphere through a nanopore are investigated. The final structure after packing (node number and complexity) and packing speed are significant parameters. The results show that by increasing the length of the polymer string and the persistence length, complex knots are formed, which is suggested to be re-simulated for larger lengths of polymer.

Keywords: Semi-flexible polymer, Nanosphere, DNA, Persistence length, knot.

1. Institute of Nanoscience and Nanotechnology, University of Kashan, Kashan, Iran.

How to pack a semi-flexible polymer inside a nanosphere by using molecular dynamics simulation and investigating its dependence on the persistence length of the polymer and the diameter of the nanosphere

Fatemeh Moharaminezhad*, Samaneh Ghanbari-Kashan and Narges Nikoofard[1]

Abstract

Polymer chains are packed in nanoscale ranges in various biological processes. For example, the genome of a virus is packed in its capsule. DNA is one of the most important biological polymers that is confined inside the cell nucleus, which has a high bending stiffness. While RNA has a very low bending stiffness. To investigate the dynamics of this limited chain, a semi-flexible polymer string enclosed in a nanosphere can be simulated and the effects of the limitation on its packing can be investigated. In this study, using molecular dynamics simulation, we investigate the packing process of a semi-flexible chain in a nanosphere through a nanopore, which shows that the way the chain is packed and the final structure depends a lot on the bending stiffness of the chain and the size of the limiting geometry. In the present simulation, by using a certain packing force for the polymer with different lengths, various structures inside the nanosphere were obtained, depending on the persistence length and diameter of the nanosphere. The results showed that the more the persistence length of the polymer or the diameter of the nanosphere decreases, the packing of the polymer takes place in a longer period of time or at a slower speed and causes the structure inside the nanosphere to assume a more regular configuration that is in the form of a spool. It is suggested to re-simulate with much larger packing forces.

Keywords: Semi-flexible polymer, Packing, Nanosphere, Simulation, DNA.

1. Institute of Nanoscience and Nanotechnology, University of Kashan, Kashan, Iran.

Synthesis of Nano graphene by intermolecular layering method

Fatemeh Rashidi*[1], Mohammad Mahdavi[2]

Abstract

In recent decades, graphene has attracted the attention of many researchers due to its extraordinary properties such as electrical and thermal conductivity, high density, optical conductivity and mechanical properties. In general, many and at the same time complex methods for the synthesis of graphene have been introduced so far. Among these methods, the synthesis of carbon structures by molecular molding method1 can provide the possibility of controlling the morphology and structure of carbon layers. In this process, a molecular pattern is used to create and repeat a desired structure of carbon atoms on a nanoscale, and carbon nanotubes, nanofibers, and porous carbons are formed based on the pattern. In this research, first, graphene was synthesized chemically using molecular tempting using carbonaceous precursors such as sucrose or sulfonated petroleum bitumen and boric acid. Synthesized Nano graphene was identified using Fourier transform infrared spectroscopy (FT-IR) and field emission scanning electron microscope (FESEM) along with energy dispersive X-ray spectroscopy (EDX). In order to carry out more accurate analyses, the mass values of bitumen, boric acid and sulfuric acid were optimized as the most important influencing parameters in the synthesis of Nano graphene using mini tab software. In general, it can be said that the results of this investigation showed that this method can be performed in the ambient temperature and atmosphere. So that by having suitable and available raw materials, this cheap synthesis is fast and leads to obtaining a high quality and high efficiency product.

Keywords: *Nano graphene, molecular molding, sulfonated bitumen, boric acid*

1. Faculty of Applied Chemistry, Malik Ashtar University of Technology, Isfahan, Iran
2. Faculty of Applied Chemistry, Malik Ashtar University of Technology, Isfahan, Iran

Chest blunt trauma of less than three rib fractures: a cohort of 250 case series

Abbas Jaafar Khaleel Al-Anbari *[1], Noor Abbas Hummadi Fayadh [2]

Abstract

Background: The most frequent bone fracture, rib fractures affect 10–20% of individuals with violent trauma and, in extreme circumstances, can also injure the internal organs. The purpose of* this study is to share our expertise in treating individuals who have isolated rib fractures due to trauma without concurrent trauma, and evaluate the importance of patients' follow up.

Methods: This was a retrospective study of 250 patients (aged approximately 10 or more). All patients were initially treated without surgery. Following management, the following data were retrieved: sex, fracture features, trauma mechanism, age, radiological selective CT scan examinations, and median follow-up time.

Results: 250 consecutive patients aged 10 or older were enrolled; 184 (73.6%) of these patients were men, and their ages ranged from 10 to 67 (mean: 61.4; median: 65). False ribs VIII-XII) were more affected, and the most frequent mechanism of rib fracture was a household accident. Associated injuries occurred in only 13 (5.2%) patients, and pneumothorax was the most frequent complication, which was recorded in 10 (4%) patients.

Conclusion: While dealing with patients who have sustained thoracic trauma, a trauma team needs to be more informed to offer them effective treatment options. Accurate diagnosis, sufficient analgesia, and efficient physical treatment are necessary to prevent complications. Estimating the number of broken ribs can help management decisions and is crucial for categorizing patients who are at a high risk of complications.

Keywords: hemothorax, pneumothorax, hemopneumothorax, blunt chest trauma, rib fractures.

1. Cardiovascular and Thoracic Surgery, Department of Surgery, College of Medicine, Al-Nahrain University, Iraq.
2. Diagnostic Radiologist, Department of Surgery, College of Medicine, Al-Nahrain University, Baghdad, Iraq. noorabbashummadi@nahrainuniv.edu.iq. Orcid: 0000-0003-3739-937X.

Investigating the energy absorption of polymer graded honeycomb structures using experimental methods in biomedical engineering

Mohammad Hadi Mazaheri Tehrani[1], Behzad Karimkhani[2], Seyed Ali Galehdari[3], Maryam Mahouri Beni[4]

Abstract

Today, energy absorbers play a very influential role in various industrial fields, ergonomics and medical engineering, such as making helmets. Therefore, placing a profile with a suitable shape and material and creating lightweight absorbers such as a honeycomb structure for these fields can solve this need to a great extent, especially in medical engineering where the goal is to make devices that in terms of biomechanics, it can prevent shocks, and in terms of biomaterials, with the right material, it can prevent shocks or inappropriate pressures and even loads that are applied to the body. With the introduction of honeycomb structures, it can be pointed out that it is an energy absorber. So far, these structures with different dimensions and different materials have been investigated, researched, built and tested in order to be able to determine the amount of energy consumption in each One of these structures was examined. In this research, the construction of the structure was done by a 3D printer, and the selected materials were tested by performing two standard tensile tests on two polymer samples, one of which was ABS and the other was PLA, and by examining the results of the tests and comparing the stress diagrams. and strain, PLA material has been selected and the construction and printing of the desired honeycomb structure has been done with PLA thermoplastic material and the results of the pressure test are presented in graphs and tables and the amount of energy absorption by this structure has been calculated.

1. Msc student in Biomechanical Engineering, Department of Mechanical Engineering, Hakim Sabzevari University, Sabzevar, Iran.
2. Phd student in Biomechanical Engineering, Faculty of Engineering, Najafabad branch, Islamic Azad University, Najafabad, Iran.
3. Assistant Professor, Faculty of Engineering, Najafabad branch Islamic, Azad University, Najafabad, Iran*.
4. Bachelor in Biomechanical Engineering, Faculty of Engineering, Najafabad branch, Islamic Azad University, Najafabad, Iran.

Simulation of human mandible bone along with design and mechanical analysis of a new dental implant model

Behzad Karimkhani[1], Ali Soleimani[2], Amir Mohammad Gholami Cheryani[3]

Abstract

Implants are devices that replace a body part and support its function. The most widely used of them are orthopedic and dental implants. In addition to facilitating the chewing process, dental implants make it easy to speak and prevent bone loss of missing teeth. One of the most important things is that it restores beauty and self-confidence to a person and returns a person to his normal life. The importance of the structure and material of these implants can be very effective and relieve the patient from the worries of this implant in his jaw. In this research, the anatomy of the tooth and important parts of the tooth have been examined first, and then a reference will be made to the implants and a brief reference to its history. First, by importing the photos of the human jaw in the image processing software in medical engineering, the photos have been checked. Then the 3D design of the human jaw bone will be extracted using this software. Then the surface correction will be done. By using the surface correction software, the necessary corrections will be made on this bone and will be transferred to the finite element software, and the implant designed using the design software will be designed along with the jaw bone. The finite element software will be sent and the forces acting on them will be checked

1. Phd student, Faculty of Engineering, Najafabad branch, Islamic Azad University, Najafabad, Iran.
2. Assistant Professor, Faculty of Engineering, Najafabad branch Islamic, Azad University, Najafabad, Iran*.
3. MSc student, Faculty of Engineering, Najafabad branch, Islamic Azad University, Najafabad, Iran.

nanocatalyst

Sedighe Gholipour

Abstract

A catalyst is something that increases the rate of a reaction. The goal of chemists is to produce a catalyst with high activity and efficiency, full selectivity, ability to separate and recover from the reaction mixture, low energy consumption and long life. Catalyst performance can be determined by controlling variables such as size, structure, spatial and electron distribution, surface composition, thermal and chemical stability. High efficiency, economic efficiency, low wastage of chemicals, low heat and energy consumption, high safety and optimal use of primary chemicals are among the advantages of nanocatalyst. For economic savings and optimal use of nanocatalyst, it is usually made as a composite and its surface is chemically modified. Research in the field of nanocatalyst has always been one of the fascinating discussions in nanochemistry and green chemistry. Green chemistry deals with healthy chemical reactions with safe products and with maximum efficiency (minimum material and energy consumption) and nanocatalyst can lead us towards this ideal. And it is predicted that the next generation of catalysts will be nano catalysts and will be included in all chemical processes so that hundreds of tons of petrochemical products can be obtained with a small amount of nano catalyst. In this article, the types of nano catalysts, their characteristics and some of their industrial uses have been investigated.

Functionalized ZnO nanoparticles with tannic acid as an antibacterial agent against Methicillin-Resistant *Staphylococcus Aureus*

Faezeh Dastgir[1], Razieh Jalal[2*]

Abstract

The significant increase in the use of antibiotics in medicine and agriculture has led to the production of antibiotic-resistant bacteria. According to the WHO, antibiotic resistance is a major global threat [1][2]. *Staphylococcus aureus* (*S. aureus*), especially the methicillin-resistant *Staphylococcus aureus* (MRSA), is an important challenge in medicine and hospital infection control. Among the new approaches to combat antibiotic resistance, zinc oxide nanoparticles (ZnONPs) is considered very important due to their high chemical stability, photocatalytic efficiency, biocompatibility, and antibacterial properties [3][4]. Tannic acid (TA), a plant polyphenol-rich in hydroxyl groups, can interact with proteins, polysaccharides, and metal ions, and has antioxidant and antibacterial activity [5][6]. The purpose of this study was to investigate the antibacterial activity of ZnONPs coated with tannic acid (ZnO@TA) on standard *S. aureus* and MRSA strains. For this purpose, ZnO@TANPs were synthesized and characterized by FT-IR, DLS, XRD, and zeta potential. ZnO@TANPs exhibited higher antioxidant activity as compared to ZnONPs by DPPH assay. The MIC value of ZnONPs and ZnO@TANPs against standard *S. aureus* was equal to 250 µg/mL. The MIC value of ZnO@TANPs for MSRA bacteria was four times lower than that of ZnONPs. MBC values for both strains were more than 1000 µg/mL. Both NPs at MIC could inhibit biofilm formation by the tested strains, whereas ZnO@TANPs at concentrations of 1.2 x MIC and 1.4 x MIC showed lower antibiofilm activity than that of

1. Department of Chemistry, Faculty of Science, Ferdowsi University of Mashhad, Mashhad, Iran
2. Department of Chemistry, Faculty of Science, Ferdowsi University of Mashhad, Mashhad, Iran
Novel Diagnostics and Therapeutics Research Group, Institute of Biotechnology, Ferdowsi University of
Mashhad, Iran

ZnONPs. In summary, ZnO@TANPs seem to have more antibacterial activity than ZnONPs against MRSA bacteria, which is probably due to their antioxidant activity.
Keywords: Zinc oxide nanoparticles, Tannic acid, Antibacterial activity, Antioxidant, Methicillin-resistant *staphylococcus aureus* (MRSA).

Synthesis of a silica nanocomposite for solid-phase microextraction of phthalates released from PVC and PET bottles

Mansoureh Behzadi*[1]

Abstract

This work explaines the electrodeposition of polycatechol/silica nanoparticles (PCAT/SNPs) composite coating on stainless steel wire for direct solid-phase microextraction of a group of phthalate esters. The influencing items on the extraction efficiency and morphology of the nanocomposite were investigated in details. After that, characterization of the nanocomposite was studied by scanning electron microscopy and Fourier transform infra-red spectroscopy. Also, the parameters related to the solid-phase microextraction method were tested. Subsequently, the proposed procedure was validated by gas chromatography-mass spectrometry by thermal desorption and acceptable figures of merit were obtained. The linearity of the calibration curves was between 0.01 and 100 ng mL^{-1} and limits of detection were in the range 0.001–0.005 ng mL^{-1}. Relative standard deviations in terms of intra-day, inter-day and fiber-to-fiber reproducibilities were measured. Also, extraction recoveries at two different concentrations were up to 94%. Finally, the applicability of the proposed method was examined through the analysis of some PVC, PC and PET bottles.

Keywords: Phthalates, Nanocomposite, Solid-phase microextraction, Plastic bottles.

1. Department of Mining Engineering, High Education Complex of Zarand, Shahid Bahonar University of Kerman, Kerman, Iran

Treatment of colored wastewater using composites based on metal-organic frameworks

Saeed zahedi asl[1], Fahimeh Hooriabad Saboor[2], Davod Seifzadeh[3]

Abstract

Industrial effluents that overflow into sewers without proper treatment have caused water pollution. This issue is so important that it has turned the issue of water pollution into one a global concern. For this reason, the scientific community is looking for a suitable and high-efficiency solution to remove different colors from industrial wastewater. The use of metal-organic frameworks among all kinds of adsorbents is very promising because of the surface, porosity, and high efficiency. In this article, various effective parameters such as surface area, porosity, pore size, and surface charge, which can be effective in absorbing and removing colored compounds from industrial effluents, have been investigated. Also, cationic and anionic dyes have been investigated and the behavior of various metal-organic frameworks against them has been observed and investigated. In addition, the behavior of metal-organic frameworks and functional metal-organic frameworks and their composites with other materials have been investigated to remove color compounds. In general, metal-organic frameworks can be promising adsorbents with high efficiency, efficiency and an important role in the treatment of colored wastewater.

Keywords: Metal-organic frameworks, dyes, effluents, adsorbents, nanocomposites

1. University of Mohaghegh Ardabili, Technical and Engineering Faculty, Chemical Engineering Department
2. University of Mohaghegh Ardabili, Technical and Engineering Faculty, Chemical Engineering Department
3. University of Mohaghegh Ardabili, Faculty of Science, Department of Chemistry

Application of silica nanoparticles for reduction of inorganic scales in water injection operation

Bahareh Nazarimanesh, Mastaneh Hajipour*, Mohammad Behnood[1]

Abstract

Water injection into hydrocarbon formations is one of the common methods for reservoirs pressure maintenance. In this method, if the ionic composition of injection water and formation water are incompatible, formation damage occurs. The formation of insoluble mineral scales due to waters incompatibility is a serious damage that results in a significant reduction in the formation permeability. In this research, focusing on strontium sulfate deposits, which is one of the common mineral scales in oil reservoirs, the mixing ratio of formation water to injection water, which causes the most amount of scale, was determined. Then, the effect of adding silica nanoparticles to injection water as a scale inhibitor was investigated. The obtained results showed that the maximum amount of scale is formed in the mixture containing 70% formation water. The results of static compatibility tests in the presence of silica nanoparticles indicated that the addition of nano silica up to 0.1 wt.% reduce scale formation.

1. Petroleum Engineering Department, Science and Research Branch, Islamic Azad University, Tehran, Iran.

The using of PCR and Nanobiosensore based on graphene oxide methods for Detection of Nuclear Transgenic Plant

Mahin Kazemi, Farrokh Karimi

Abstract

In recent years cultivation of nuclear transgenic plants and their products have been increased. Concerns in biosafety of these plants caused that identification and labeling of them more be considered. In this study, the performance of two techniques including polymerase chain reaction (PCR) and nanobiosensor were evaluate and compared for detection of transgenic tobacco plants. In PCR method specific primer for amplification of 35S promoter was used for detection of tobacco transgenic plants. In results the sensitivity of PCR was evaluated 8µg/µl of genomic DNA. In addition PCR method, graphene oxide based nanobiosensor method was also evaluated for detection of transgenic tobacco plants. In this method labeled specific probe for 35S promoter was designed and used for detection of target genomic DNA sequence. The sensitivity of this method was determined 2µg/µl genomic DNA. Finally the results indicated that graphene oxide based nanosensor was more sensitive than PCR method.

Key words: Nuclear Transgenic Plants, PCR, Nanotechnology, Biosafety, Nanobiosensor

Investigation of Thermal and Phase Properties of Mesoporous Nanostructured Titania Synthesized by Polymer Sol-gel Method

Vahideh Tajer Kajinebaf[1]

Abstract

Titanium dioxide or titania is used as a semiconductor in various industries. One of the best methods for synthesis of titania is the sol-gel process. Since this process is generally carried out by the colloidal method, in this article the conditions of obtaining nanostructured titania using the polymer sol-gel method are investigated. Then the properties of the final product are evaluated. In this regard, first, polymeric titania sol was prepared using titanium tetraisoperoxide, isopropanol, deionized water and nitric acid under stable conditions. Then the properties of the resulting sol were investigated in terms of solution stability and particle size using zeta potential and DLS. Finally, the effect of the synthesis method on the thermal properties and phase transformations of titania, especially the anatase to rutile transformation temperature, the size of the final particles and the microstructure of the powders were studied using the results of DTA-TG, XRD, TEM and nitrogen absorption and desorption. Using the results of DLS analysis, the size distribution of polymeric sol particles was obtained in the range of 0.5-1.1 nm. The results of phase analysis showed that the anatase phase is the only stable phase in the structure up to 700 ºC and no effects of rutile phase formation are observed up to this temperature range. The results of nitrogen adsorption and desorption analysis on synthetic titania also showed an absorption curve of type IV with hysteresis loop of type H_2, which is indicative of mesoporous materials. Also, the results of the BJH curve showed that synthetic titania has a narrow pore size distribution in the range of 2-9 nm. Based on TEM images, the size of anatase crystals synthesized by polymer method was determined to be around 12 nm. The results showed that mesoporous nanostructured anatase with high temperature stability can be synthesized using polymeric sol-gel method.

Keywords: Titania, Polymeric sol-gel, Phase Analysis, Thermal Analysis, Mesopore, Nanostructure

1. Department of Materials Engineering, Takestan Branch, Islamic Azad University, Takestan, Iran

Study of the effect of Nano-niosome containing *zataria multiflora* essential oil on the *Staphylococcus aureus* induced keratitis in rat

Khosravi N. [1], Moslemi H.R. [2*], Kafshdouzan Kh. [3] Nourbakhsh M.S. [4]

Abstract

Bacterial keratitis is an infection that cause inflammation of the cornea and one of the most common complications following the use of contact lenses. *Zataria multiflora* is among popular medicinal plants that has received a lot of attention for treating infections due to having anti-bacterial effects. Nano drug delivery systems are drug carriers with nano-sized dimensions, which carry drugs or biomolecules and release them at the target tissue. The aim of the present study was to determine the antibacterial effect of Nano-niosome containing *Zataria multiflora* essential oil on the bacterial keratitis in rats. Staphylococcus aureus keratitis was induced in 30 rats by injection of bacteria into the left corneal stroma. Treatment was started 24 hours later with one of three randomly assigned protocols: ciprofloxacin (3 mg/mL), Nano-niosome containing *zataria multiflora* and 0.9% saline eye drops. Eye drops were administered every hour. The rats were killed on days 4 and 8, and their corneas were removed for bacterial counts. The results showed that the microbial load of the corneas in the Nano-niosome drop group was significantly lower than the control group. Considering the antimicrobial effects of essential oil of *zataria multiflora* and the desirable properties of nano-systemic structure as essential oil carrier, the results of this study showed that Nano-niosome drop containing *zataria multiflora* can be a suitable alternative to common antibiotics in the treatment of keratitis.

Keywords: Bacterial keratitis, Zataria multiflora, Nano-niosome.

1. Department of Clinical Sciences, Faculty of Veterinary Medicine, Semnan University, Semnan, Iran.
2. Department of Clinical Sciences, Faculty of Veterinary Medicine, Semnan University, Semnan, Iran.
3. Department of Pathobiology, Faculty of Veterinary Medicine, Semnan University, Semnan, Iran.
4. Faculty of Materials and Metallurgical Engineering, Semnan University, Semnan, Iran.

Examination the effect of pH on the activity of nanosystem containing chondroitinase ABCI based on hydroxyapatite

Fatemeh Afraei[1], Sara Daneshjou[2*], Bahareh Dabirmanesh[3]

Abstract

In this research, chondroitinase ABCI isolated from the Proteus vulgaris bacterium was immobilized on hydroxyapatite nanoparticles. The maintenance of this enzyme is very limited and one of the ways to overcome its limitation is to immobilize the enzyme. Hydroxyapatite is a non-toxic ceramic biomaterial that has a high surface area, which is beneficial for loading a large amount of enzyme. Hence, to achieve the better medicinal activity, chondroitinase ABCI was immobilized on hydroxyapatite nanoparticles for 12 hours at 4◦C at pH 5, 6.8, and 8. Characterization of the immobilized enzymes was carried out using the field emission gun- scanning electron microscopy, FT-IR, and UV-spectroscopy. The findings indicate that the immobilized enzyme on hydroxyapatite nanoparticles has a higher activity efficiency at pH 5. Also, the results indicate that the formation of coordination bonds between hydroxyapatite and enzyme is complemented by electrostatic bindings between charged groups of enzyme and nanoparticles.

Keywords: Activity, Chondroitinase ABCI, Hydroxyapatite, Nanosystem

1. MSc Student, Nanobiotechnology Department, Faculty of Biological Science, Tarbiat ModaresUniversity, Tehran, Iran
2. *Assistant Professor, Nanobiotechnology Department, Faculty of Biological Science, Tarbiat Modares University, Tehran, Iran
3. Assistant Professor, Biochemistry Department, Faculty of Biological Science, Tarbiat Modares University, Tehran, Iran

Applications of nanotechnology in drug delivery and tissue engineering

Poorya keshavarz[1], Pariya Keshavarz[2]

Abstract

The application of nanotechnology in medicine, which is referred to as nanomedicine, offers countless exciting possibilities. Here we discuss two important aspects of nanomedicine, drug delivery and tissue engineering. In recent years, advances in medical technology and specifically in targeted drug delivery have increased rapidly in nanotechnology. Currently, many materials are being researched for drug delivery and especially for cancer therapy. Interestingly, pharmaceutical sciences also use nanoparticles to reduce the toxicity and side effects of drugs. In addition, the small size of the nano allows access to the cell and different parts of the cell, including the nucleus. Nanoparticles are also considered as new intravascular or cellular probes, for diagnostic and therapeutic purposes (drug/gene transfer), which are expected to create new innovations and play a fundamental role in medicine, and to the production stage. reach. Targeted drug-gene delivery and its timely diagnosis in cancer treatment is one of the research priorities in which nanomedicine plays a vital role. As a result, nanoparticles for drug delivery and imaging have been gradually developed as new methods for cancer treatment and diagnosis. This review shows the emerging role of nanotechnology in drug delivery.This article is applied in terms of purpose, experimental and laboratory data and quantitative in nature.

Keywords
Nanotechnology; nanomedicine; drug delivery; tissue engineering

1. Master of Chemical Engineering. Bushehr city. Graduated from Kherd Bushehr Institute of Higher Education
2. Master's student in microbiology, majoring in pathogenic microbes. Bushehr city. Khord Higher Education Institute.

Radical Scavenging Activity of Calcium Oxide Nanoparticles Biosynthesized from *Cordia Myxa* Leaves Aqueous Extract

Yasaman Mousavi[1]*, Alireza Momeni[2], Mohammad Hadi Meshkatalsadat[3]

Abstract

The synthesis of nanoparticles, particularly metal and metal oxides nanoparticles, has become a popular field of research today. Biological syntheses are the most environmentally friendly and economic method of producing nanoparticles among all possible techniques. The majority of research has focused on plant components, especially their leaves, which are the safest and least expensive. Throughout this study, we also used a species of plant that grows abundantly in warm zones and is one of the evergreen plants. *Cordia myxa* leaves extract with ancient therapeutic properties were used as a reducing and stabilizing agent. It is known that calcium oxide nanoparticles (CaO NPS) possess antimicrobial properties, which have been studied less than other metal oxide nanoparticles. In this study, antioxidant properties of these nanoparticles were investigated to further investigate their biomedical properties. Based on green chemistry principles, the nanoparticles prepared in this research are safe and economical, leaving no harmful residues behind. In addition to UV-Vis and FT-IR spectroscopy, XRD and SEM were used to analysis the synthesized nanoparticles. A monophasic cubic structure was determined from XRD results of the nanoparticles with an average crystallinity of 52.22 nm. According to SEM images, the designed nanoparticles have an almost spherical shape with dimensions between 32.40 and 83.21 nm. Furthermore, the radical scavenging activity of CaO NPs was found to be significantly higher than that of the control sample at 12.5 μg ml^{-1}, which suggests that these nanoparticles can remove radicals at low concentrations.

Keywords: Cordia myxa leaf; Antioxidant; Biosynthesis; Calcium oxide; Nanoparticles; Metal oxides

1. Department of Chemistry, Qom University of Technology, I.R Iran
2. Department of Chemistry, Qom University of Technology, I.R Iran
3. Department of Chemistry, Qom University of Technology, I.R Iran

Synthesis and application of Fe_3O_4@mcm-41 nanoparticles in medical imaging of traumatized male rats by injecting venous contrast agent

Negin Nejatmand, Dr. Mostafa Golshekan, Dr. Mahmood abedinzade, Dr Behzad Zohrevandi, Dr Shahram Taeb.

Abstract

Introduction: Every year, 5.48 million people in the world suffer from brain trauma, among which a large number suffer from permanent brain disorders. In order to have a better evaluation of the brain, various imaging methods are used. One of the most important and accurate of them is MRI. Also, MRI with contrast material is one of the most important strategies for diagnosing pathologies. But due to the known side effects of contrast agents, such as nephrogenic systemic fibrosis, it is necessary to use new alternative methods to reduce side effects, one of the good alternatives are magnetic nano particles which can be used for drug delivery in tissues.

First, the desired nanomedicine was synthesized as Fe_3O_4@MCM-41. In the next step, new nanoparticles were made as porous **Conclusion:**

Results:

Methods and Materials:

and mesoporous Fe_3O_4@MCM-41-Gadolinium complex, then the accuracy of its structure was confirmed by instrumental analysis. In the last stage for clinical evaluation, the synthesized nanomedicine was injected into 16 mice in two groups of 8, and in one of the groups, the nanomedicine was guided by a magnet with an external field. After creating analgesia and anesthesia, two mice from each group were killed in certain minutes (10, 20, 40, 60 and 70) and the concentration of the contrast material in the brain tissue was measured by liquid chromatography.

The concentration of the contrast agent in the group that was affected by the magnetic field increased from 0.1% to 46% after 10 minutes and increased to 76% 70 minutes after the injection. This increase was significantly higher than the other group that was not affected by the field.

The production and use of magnetic nanocomposites not only significantly increased the amount of drug delivery to the target tissue, but also reduced the total concentration of the contrast agent required for imaging. This is a significant improvement in people with underlying kidney diseases or people

who frequently need MRI imaging with contrast material (such as people with progressive multiple sclerosis). Also, the production of nanomedicine is relatively low-cost and has many advantages. But the widespread use of these nanomedicine requires more clinical research.

Keywords: Magnetic resonance imaging, magnetic nanoparticles, gadolinium based contrast agents.

A review on the performance of heterogeneous electrocatalysts in the electrochemical evolution of hydrogen

Mohammad Saleh Khaleghi*[1]

Abstract

Hydrogen gas has a high energy density and if it is produced with electricity from clean energies, it is considered a clean and economical fuel. Hydrogen production is done by electrochemical separation of water. This leads us to investigate cheap and resistant electrodes that require a lower voltage for the electrochemical production of hydrogen. In this study, we focused more on the electrocatalytic activity of homogeneous electrocatalysts without noble metals. The electrochemical production of hydrogen depends on the surface and intrinsic characteristics of the electrode, which in the studies have been investigated by selecting the desired elements and compounds such as noble metals, strain engineering, doping heteroatoms, coupling, designing synergistic composites, and nanomaterials engineering including layer thinning, edge engineering, defects and mesopores improved them. The criteria for choosing the best electrode were high electrocatalytic activity, stability, cheapness, safety and abundance. To measure the electrocatalytic activities, the value of the Tafel slope, the onset potential and the overpotential against the current density were used. The investigated electrodes mostly included Fe, C, O, S, Al, Mo, Se, Ti, Co, Ni, V, Cu, Ta, and a few had Pt, Ir, Ru.

Keywords: Hydrogen production, Homogeneous Electrocatalysts, Hydrogen Evolution, HER, Electrode

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1. Bachelor of applied chemistry, Payam noor university,Tehran

Effect of using GO/$FeNi_3$ nanoparticles on the compressive strength parameters of concrete

Rasool Zabeti[1], Amin Honrabakhsh*[2], Rahele Zhiani[3]

Abstract

Improving the quality of concrete has been the focus of material research in the last two decades. There are several reasons for using nanomaterials in concrete, such as environmental issues, quality improvement, and the need for special concretes for special conditions. Some of these materials are being used in the industry due to their positive effects, and the effect of some others on the behavior of concrete types is still under investigation. The purpose of this research in the first stage was the synthesis of GO/$FeNi_3$ nanoparticles, which was proved by FTIR and SEM spectra, and then the effect of this nanoparticle on the compressive strength of concrete was investigated. Based on this, the compressive strength of concrete samples based on the ages of 7 and 28 days using 2% GO/$FeNi_3$ nanoparticles independently shows a 20% increase.

Keywords: nanoparticles, concrete, compressive strength, mechanical strength

1. Master's student, Civil Engineering - Construction Management, Sobhan Institute of Higher Education Neyshabur, Iran
2. *Assistant Professor, Department of Civil Engineering, Neyshabur Branch, Islamic Azad University, Neyshabur, Iran
3. Associate Professor, Department of Chemistry, Neyshabur Branch, Islamic Azad University, Neyshabur, Iran

The effect of the simultaneous use of rubber fibers and $GO/FeNi_3$ nanoparticles on the parameters of tensile strength of concrete

Rasool Zabeti[1], Amin Honrabakhsh[3], Rahele Zhiani[2*]

Abstract

Strengthening and fixing building material defects has always been a construction challenge in modern construction projects. In this regard, with the increasing development in the field of materials, products, and innovative methods, moving towards a basic strategy for structures with better performance, greater economic efficiency, and the replacement of part of the building materials from materials incompatible with the environment, such as tire rubber It is inevitable and it is considered a new way to achieve sustainable development. The purpose of this research in the first stage was the synthesis of $GO/FeNi_3$ nanoparticles, which was proved by FTIR and SEM spectra, and then the simultaneous effect of these nanoparticles and rubber fibers on the tensile strength of concrete was investigated. The highest tensile strength in this composition has increased between 10 and 13% at 7 days and between 9 and 10% at 28 days.

Keywords: nanoparticles, rubber fibers, building materials, tensile strength

1. Ma ster's student, Civil Engineering - Construction Management, Sobhan Institute of Higher Education Neyshabur, Iran
2. * Assistant Professor, Department of Civil Engineering, Neyshabur Branch, Islamic Azad University, Neyshabur, Iran
3. Associate Professor, Department of Chemistry, Neyshabur Branch, Islamic Azad University, Neyshabur, Iran

Nano chemistry

Mohammad Asli*[1]

Abstract

The following article is a review method that has been written by referring to reliable internet sources and databases, articles registered in various scientific seminars and conferences. In this article, the nature of Nano chemistry and its purpose, functions and types of branches are examined. We will discuss its consequences and its results in human life. In today's society, with the progress and spread of science and technology, efforts have been made to find new sciences and new technologies in order to improve the quality of society more than in the past. Meanwhile, one of these sciences is nanotechnology. One of the important sub-branches of this technology is Nano chemistry, which deals with the study and synthesis of compounds in Nano dimensions. and to brilliant results in various fields, including medicine (diagnosis and treatment of various diseases), Nano carbon (use in sensors), Nano catalysts and keeping the environment free from pollutants, clean energy production, food and feed industries , wound dressing and These cases are only a few of the achievements discovered by experts and scientists around the world. Nanotechnology is like an ocean that humans have seen a very small part of. Placing the dimensions of the material on the Nano scale causes a change in its various properties, including physical, chemical and biological properties, which causes the properties of the material produced on the Nano scale to be different from the normal state or similar to it, with the difference that the efficiency and have higher efficiency and help us in doing various tasks and operations and make it easier to do things. In recent years, the our dear country Iran has achieved remarkable progress and success in this field and is considered one of the pioneering countries in the Nano industry.With the efforts of local scientists and specialists, by localizing this science and using it optimally and correctly, we can help improve the society and industry of our country and make our country progress, and in this way we can achieve the improvement of people's lives and their health.

Keywords: Nano, Nano chemistry, Nano catalyst, Nano carbon

1. *Continuous undergraduate student of chemistry education at east Azerbaijan farhangian university Tabriz allameh amini pardis

Introduction of Mxenes, synthesis method and application of Ti_3C_2 in photocatalytic processes

Zeynab Abdeyazdan[1*], Fateme Salehi-Najafabadi[2], Arjomand Mehrabani-Zeinabad[3], Mohammad Rahmati[4]

Abstract

This article briefly deals with the common synthesis methods and photocatalytic applications of Mxenes.Mxenes are transition metal carbides and nitrides. These compounds have been proposed as an alternative to improve photocatalytic processes in renewable energy and environmental remediation programs due to their high surface area with adjustable two-dimensional structure. Mxenes have been successfully used as catalysts or co-catalysts for the processes of carbon dioxide reduction to fuel, nitrogen fixation, hydrogen production and photochemical degradation due to interlayer groups and flexible interlayer spacing. So far, more than 30 compounds of the Mxene family have been produced. In recent years, in addition to the surface characteristics, Mxenes have become popular due to the presence of hydrophilic texture (due to the presence of hydroxyl, fluorine and oxygen groups at the end of the surface), metallic conductivity, high Young's modulus, variable energy gap, strength and stability, ability Formability and flexibility, high resistance to wear and corrosion, and excellent photoelectronic characteristics have become popular 2D materials. This article briefly deals with the common synthesis methods and photocatalytic applications of Mxene.

Keywords: Photocatalytic process, Mxene synthesis, etching, Ti_3C_2

1. Master student, Department of Chemical Engineering, Isfahan University of Technology, Isfahan, Iran
2. Master student, Department of Chemical Engineering, Isfahan University of Technology, Isfahan, Iran
3. Professor of Chemical Engineering, Department of Chemical Engineering, Isfahan University of Technology, Isfahan, Iran
4. PhD student, Faculty of Chemical Engineering, Isfahan University of Technology, Isfahan, Iran

Conversion of carbon dioxide into a product with added value in the presence of $ZnAl_2O_4$ nanofibers

Javad Sharafkhani[1], Rahele Zhiani[2*]

Abstract

Considering the environmental issues and the need for correct and timely detection of pollution in environmental samples such as water, soil, and air, there is always a need for different types of adsorbents for analytical work. The purpose of this research is to absorb CO_2, which is a dangerous gas for the environment, and convert it into cyclic carbonate, which is one of the important solvents in the industry. After the synthesis of $ZnAl_2O_4$, this nanofiber was identified by SEM and TEM, and the results showed that this nanoparticle converts carbon dioxide into formate cyclic carbonate, which is used as a suitable solvent in the industry.

Keywords: nanofiber, carbon dioxide, $ZnAl_2O_4$, cyclic carbonate

1. Department of Chemistry, Neyshabur Branch, Islamic Azad University, Neyshabur, Iran
2. Department of Chemistry, Neyshabur Branch, Islamic Azad University, Neyshabur, Iran
New Materials Technology and Processing Research Center, Department of Chemistry, Neyshabur Branch, Islamic Azad University, Neyshabur, Iran

Prediction of the permeability and selectivity of polysulfone mixed matrix membrane and SBA-15 mesoporous particles using artificial neural network

Gholamhossen Vatankhah[1,*]

Abstract

In this study, the performance (permeability and selectivity) of the mixed matrix membrane synthesized from a polysulfone matrix containing modified SBA-15 nanoparticles was modeled in order to separating CO_2 and CH_4 gases using artificial neural network. Average pore size, pore volume, specific surface area and filler particle size, filler content in membrane matrix as 5 network inlet parameters and carbon dioxide permeability and CO_2/CH_4 selectivity as 2 network output parameters was considered. Multi-layer perceptron (MLP) network with Bayesian regularization training algorithm was used for modeling. Collected data of the experimental operation was used to ANN training and optimum numbers of hidden layers and neurons (arrangement 5:10:2) were obtained by trial-error method. Based on the results, the predicted values demonstrate an excellent agreement with the experimental data, with high correlation ($R^2 = 0.9995$) and very low error (MSE = 0.0013). As a result, ANN can be recommended as a powerful method for the predicting of performance of mixed matrix membrane with high precision.

Keywords: Mixed matrix membrane, Permeability, Selectivity, Artificial neural network

1. Department of Chemical Engineering, Islamic Azad University, Bushehr Branch, Bushehr, Iran.

Investigating the Effect of Students' Mathematical Knowledge in Physical Chemistry and Related Misconception

Mohammad Salehi Avval[1]

Abstract

Misconception refers to any kind of false notions that cause non-scientific beliefs, confused concepts, simple concepts and theories without scientific roots. Misconceptions cover a wide range of scientific concepts. Misconception exist not only in different disciplines, but also in interdisciplinary areas. Understanding the basic concepts in thermodynamics greatly helps students' ability to establish a connection between mathematical equations and macroscopic phenomena. The present article is a review article in which the issue of students' skill in applying mathematical equations in thermodynamic laws is discussed. Many students do not have serious problems in mathematics. They can interpret the first and second order partial derivatives well and they got good marks in math in the last semesters, but the major problem arises when these people cannot apply math in chemical physics. Perhaps because of this abstract nature, it is challenging for students to interpret mathematical expressions and relate them to information related to macroscopic systems.

Key words: Misconception, Mathematics, Physical Chemistry, Mathematics in Chemistry.

1. Bachelor student of Chemistry Education, Farhangian University,Tehran, Iran.

Dependence of optical band gap and crystal structure of nanoelectroceramic PMN-PT on zirconia

Mahdi Ghasemifard, Misagh Ghamari

Abstract

In this study, nanoelectroceramic (1-x)Pb($Mg_{1/3}$,$Nb_{2/3}$)O_3-xPb($Zr_{0.52}$,$Ti_{0.48}$)O_3 for x=0.35 was prepared by sol-gel combustion method. The effect of calcination temperature on the structure and properties of PMN-PT:Zr nanopowders was investigated. The optical band gap of the samples was obtained using the absorption spectrum diagram. Investigations showed that at the calcination temperature of 850 ^{o}C, the samples prepared by this method have a single-phase perovskite crystal structure. Examining the SEM images prepared from the tablets at different annealing temperatures shows that increasing the temperature causes the growth of grains and the reduction of porosity. The results show that the best annealing temperature of PMN-PT:Zr ceramic is 1250 ^{o}C. By adding zirconium impurity, it is expected that a noticeable change in the optical properties of PMN-PT will be achieved.

Evaluating the Effect of Electrospun Polyvinyl Alcohol Nanofiber Containing Pistachio Hull Extract on the Healing of Experimental Achilles Tendon Injury in Rat

Rezaee A. [1], Moslemi H.R. [2*], Nourbakhsh M.S. [3], Ghaffari Khaligh S. [4]

Abstract

Injury and degeneration of tendons can be highly debilitating and can result in substantial pain, disability, and healthcare costs. Nano-sized fibers have a much wider surface area than conventionally produced fibers, which can hold composite materials more compactly and thus provide greater mechanical capabilities. In this study, the injured tendon was treated by electrospun PVA mats containing Pistachio Hull Extract (PHE) and histopathological results of healing were evaluated. After preparing the pistachio hull extract, electrospun PVA/PHE nanofibrous mats were fabricated using the electrospinning method. The morphological and structural properties of the fabricated mats were characterized by SEM, FTIR and XRD. 45 male Wistar rats were prepared and a partial thickness tenotomy was created on right hindlimbs. All rats were divided into three groups (n=15) and three sub-groups (n=5) including, PVA/PHE nanofibers, PVA nanofibers, and without any treatment as a control group. Histological samples were taken on days 14, 28, and 42. Statistical analysis was performed by the Kruskal-Wallis using the SPSS software. The histological analysis on days 14, 28 and 42 indicated significant difference was observed between PVA/PHE and two other groups. While no significant difference was observed between the PVA and the control groups. In summary, these results suggest that the pistachio hull extract-loaded nanofibers mats promoted the healing process of damaged Achilles tendon in rats.

Keywords: Pistachio hull, Electrospinning, Achilles, Rat.

1. Department of Clinical Sciences, Faculty of Veterinary Medicine, Semnan University, Semnan, Iran
2. Department of Clinical Sciences, Faculty of Veterinary Medicine, Semnan University, Semnan, Iran
3. Faculty of Materials and Metallurgical Engineering, Semnan University, Semnan, Iran.
4. Department of Pathobiology, Faculty of Veterinary Medicine, Semnan University, Semnan, Iran

The effect of the healing rate of Polyvinyl Alcohol Nano-Fibers Containing Pistachio Hull Extract on healing of bone defect induced in the rat calvarium

Farmand M[1], Moslemi H.R. [2*], Yousefi M.H. [3], Ghaffari Khaligh S. [4]

Abstract

Fracture healing is important in medicine; thus seeking new techniques with fewer side effects to improve the speed of the healing is prudent. Pistachio hull extract has strong antioxidant properties that can be used as scaffolds in nano dimensions. This study aimed to evaluate the effect of nanofibers containing pistachio hull extract on bone defect healing in rat calvaria. After preparing the pistachio hull extract (PHE), electrospun PVA/PHE nanofibrous mats were fabricated using the electrospinning method. The morphological and structural properties of the fabricated mats were characterized by scanning electron microscopy, Fourier-transform infrared spectroscopy, and X-ray diffraction. Histopathological assessments were performed on 45 male Wistar rats on days 14, 28 and 42. A 7-mm bone defect was created in the calvaria of all rats. The animals were divided into three groups, and the defect in each group were covered with PVA/PHE, normal saline, and PVA wound dressings. Statistical analysis was performed by the Kruskal-Wallis using the SPSS software. Based on the results, no significant difference was observed between the studied groups on day 14. On days 28 and 42, there was a significant difference between the PVA/PHE and the other two groups, while no significant difference was observed between the PVA nanofiber group and the control group. The results revealed that PVA/PHE can increase the amount of bone formation and improve the healing process in the defect created in the rat calvarium bone. Therefore, it may be considered a promising alternative for clinical administration.

Keywords: Calvarium, Nanofiber, Pistachio hull, Rat.

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1. Department of Clinical Sciences, Faculty of Veterinary Medicine, Semnan University, Semnan, Iran
2. Department of Clinical Sciences, Faculty of Veterinary Medicine, Semnan University, Semnan, Iran
3. Department of basic Sciences, Faculty of Veterinary Medicine, Semnan University, Semnan, Iran
4. Department of Pathobiology, Faculty of Veterinary Medicine, Semnan University, Semnan, Iran

The Origin and Impact of Nano and Microplastics in Water and Wastewater Treatment Processes

Farshad Golbabaei Kootenaei[1,*], Nasser Mehrdadi [2], Mohammad Javad Amiri [3]

Abstract

The presence of nanoplastics and microplastics in water has increasingly become a major environmental challenge. A key challenge in their detection lies in the relatively inadequate analytical techniques available, which prevent a deep understanding of the fate of nanoplastics and microplastics in water. The presence of nanoplastics and microplastics in water and wastewater treatment plants causes concern about the quality of treated water. Nanoplastics and microplastics, due to their widespread but small size and diverse chemical natures, may easily enter water and wastewater treatment processes and cause challenges in treatment processes. The purpose of this article is to investigate the fate and impact of nanoplastics and microplastics in water and wastewater treatment plants. The formation mechanisms, physical and chemical properties, and presence of nanoplastics and microplastics in water are related to the interactions of nanoplastics and microplastics with water and wastewater treatment plant processes, and potential solutions to limit these interactions are explored.

keywords: Nanoplastic, Microplastic, Treatment, Wastewater, Water quality.

1. Faculty of Environment, University of Tehran
2. Faculty of Environment, University of Tehran
3. Faculty of Environment, University of Tehran

Zinc oxide nanoparticles synthesized by the green method increases the differentiation of mesenchymal stem cells into osteoblasts.

Babak Farzin pour , Tayebeh Mohammadi , Leila Soltani , Mehrdad Pooyanmehr

Abstract

Green nanobiotechnology means the synthesis of nanoparticles using microorganisms, plants and viruses, and due to the wide applications of nanoparticles and nanocomposites, there has been a great desire to synthesize them. The purpose of this study was to investigate the effect of zinc oxide nanoparticles synthesized by the green method on the level of alkaline phosphatase enzyme activity during the differentiation process of mesenchymal stem cells into osteoblastic cells. Zinc oxide nanoparticle was synthesized with purple leaf extract and identified. Mesenchymal stem cells derived from the bone marrow were cultured as two control and treatment groups. After 24 hours, the medium of the cells was replaced with a special culture medium for osteogenic differentiation. 10 µg/ml green zinc oxide nanoparticles were also added to the well of the treatment group. The culture period was 14 days. At the end, the amount of alkaline phosphatase enzyme was determined with the help of a special kit. The statistical comparison of the data obtained from the two groups with the T-test showed that the enzyme activity in the group treated with green zinc oxide nanoparticles was significantly higher than the control group. Adding zinc oxide nanoparticles synthesized by the green method with the help of purple leaf extract to the differentiation culture medium of bone marrow mesenchymal stem cells increased their differentiation potential into osteogenic cells, which is confirmed by the increase in alkaline phosphatase enzyme activity.

Key words: zinc oxide nanoparticles, green synthesis, alkaline phosphatase, Osteoblast, Mesenchymal stem cell.

Laboratory study of gas storage in modified metal organic frameworks

Navid Mohammadi[1], Majid Safajou-Jahankhanemlou[2], Amir Heydari[3]

Abstract

Increasing the level of carbon dioxide emissions is one of the major environmental challenges that humanity is facing today. In recent years, the increase in human population and industrial activities after the industrial revolution has increased the consumption of fossil fuels. Carbon dioxide produced by burning fossil fuels has the largest share in the production of greenhouse gases and global warming. From the past until now, various methods such as cryogenic distillation, membrane separation and adsorption have been used for carbon dioxide storage. On the other hand, porous materials such as zeolites and metal organic frameworks have been studied for the separation and absorption of carbon dioxide. Among these technologies, surface adsorption is the most practical method and is economically preferred over other methods. Due to recent advances in porous materials, these materials are thought to have many advantages, especially in gas absorption. Metal organic frameworks are a group of microporous material compounds with metal ions or metal clusters and organic ligands. Interest in these materials increases due to several characteristics, including high porosity and high chemical and thermal stability levels. Also, this class of materials can be transformed into completely different structures due to its ability to work with different functional groups. On the other hand, compared to traditional inorganic porous adsorbents, metal organic frameworks are one of the best materials with high chemical stability, homogeneous and adjustable pore size, and high surface area, which are widely used in separation, catalytic applications, and gas adsorption and storage.

Keywords: Metal Organic Frameworks, surface adsorption, gas adsorption, carbon dioxide

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1. Department of Chemical Engineering, Faculty of Engineering, University of Mohaghegh Ardabili Ardabil 56199-11367, Iran
2. Department of Chemical Engineering, Faculty of Engineering, University of Mohaghegh Ardabili Ardabil 56199-11367, Iran
3. Department of Chemical Engineering, Faculty of Engineering, University of Mohaghegh Ardabili Ardabil 56199-11367, Iran

The effect of reaction conditions on the loading capacity of cationic tetracycline drug onto cellulose nanocrystal carriers

Kiana Kasbi, Zahra Nazemi, Mohammad Sadegh Nourbakhsh, Mahsa Janmohammadi

Abstract

Cellulose nanocrystal (CNC) is prepared by acid hydrolysis of cellulose. Due to its negative charge, CNC can interact electrostatically with cationic drugs such as tetracycline hydrochloride (TCH) and can be used as a carrier in drug release applications. The electrostatic interaction between CNC and TCH is influenced by various factors including reaction time, drug/ CNC ratio, and the solvents. This study aimed to investigate the loading capacity of TCH on CNC in different reaction conditions such as time, solvent, and ratios. First, three different weight ratios of TCH-CNC (1:1, 2:1, 1:2) were prepared, and exposed to each other at 30 minutes,1, 4, and 24 hours before the absorption test. Also, the effect of aqueous and saline solvents (magnesium chloride and calcium chloride) on the absorption of TCH was evaluated. The amount of drug loading on CNC was obtained by the calibration curve at a wavelength of 360nm with Elisa Reader. The results showed that the time at 24 hours can separate the drug from cellulose nanoparticles due to the small dimensions of TCH. The CNC to TCH with a 2:1 weight ratio in 1 hour had the highest encapsulation efficiency. The optimal sample of this section was synthesized with saline solvents. The increase in encapsulation efficiency of the drug in saline solvents was clearly evident. The magnesium chloride salt solution with about 65% TCH loading was selected as the optimal sample. This research suggests CNC is a suitable carrier for medical applications such as drug-loaded wound dressings.

Keywords: Cellulose nanocrystal, Drug adsorption, Nanocarriers, Tetracycline

Separation of functionalized graphene nanoparticles from aqueous medium by styrene atom transfer radical polymerization

Parian Biabani[1], Majid Safajou-Jahankhanemlou[2], Amir Heydari[3]

Abstract

The majority of vinyl monomers have the ability to be polymerized through the atom transfer radical polymerization process. The atom transfer radical polymerization process is based on the balance between an active component and an inactive component, which causes all the chains to grow together at the same time and the resulting polymer has a narrow molecular weight distribution. This process can be done in solvent, bulk, emulsion, dispersion and suspension environments and the important point is that the exact selection of monomer, reaction environment and temperature, initiator and catalyst system and other additives for polymer synthesis with specific structure and functionality and molecular weight distribution It is a very important control. Atom transfer radical polymerization has been successfully used to prepare various advanced materials. The resulting polymer can be dehalogenated in a process or the halogen end groups can be converted to other functionalities using nucleophilic substitution reactions or electrophilic addition reactions. Polystyrene chains were synthesized by atom transfer radical polymerization in the presence of surface modified graphene nanoparticles and functionalized graphene through hydroxyl groups. The polymerization of styrene in the presence of modified graphene and initiator was carried out at the required temperature, then the effects of different bond densities and different charges of graphene on the characteristics of heterogeneous bonds and free polystyrene chains as well as their polymerization kinetics were investigated by gas permeation chromatography. The efficiency of the grafting

1. Department of Chemical Engineering, Faculty of Engineering, University of Mohaghegh Ardabili, Ardabil 56199-11367, Iran
2. Department of Chemical Engineering, Faculty of Engineering, University of Mohaghegh Ardabili, Ardabil 56199-11367, Iran
3. Department of Chemical Engineering, Faculty of Engineering, University of Mohaghegh Ardabili, Ardabil 56199-11367, Iran

reactions was investigated by photoelectron spectroscopy, elemental analysis and thermo gravimetric analysis, and finally the morphology of functionalized graphene was studied by transmission electron microscopy.

Keywords: Polystyrene, graphene, atom transfer radical polymerization

Efficient route for preparation of yttrium oxide nanoparticles at low temperature

M.M. Arghavan[1], A. A. Sabouri-Dodaran[*, 2], M. Sasani Ghamsari[3,*]

Abstract

Yttrium oxide nanoparticles are one of the proper host materials for rare-earth elements. The rare-earth ions doped in yttrium oxide nanoparticles have medical applications such as biological imaging, photonic applications such as waveguides in the infrared region, laser active material, etc. The preparation of yttrium oxide particles is usually done through the solid state process and at a very high temperature such as 1200°C. Of course, there are reports that claim to produce this compound in micron dimensions at a temperature of 600°C. In this research, using the solid-state process and during multi-step heat treatment, at temperatures of 240, 380, and 500 °C, white powder of yttrium oxide was prepared in 6 hours. The resulting powder was studied using characterization methods such as X-ray diffraction, electron microscope, etc. The results showed that the produced yttrium oxide has a cubic structure and average particle size between 22 and 65 nm.

1. Basic Science School, Payam Noor University, 1659639884, Tehran, Iran.
2. Basic Science School, Payam Noor University, 1659639884, Tehran, Iran.
3. Photonics and Quantum Technologies Research School, NSTRI, 11155-3436, Tehran, Iran.

Principles of smart drug delivery and how to respond to different stimuli

Mirsasan Mirkarimi, Nilofar Nasirpour, fatemeh kaboli

Abstract

Unprecedented advances in biomedicine in the past few decades have given scientists hope to use smart drug delivery methods instead of traditional drug delivery methods. This drug delivery method reduces the side effects and toxicity of the cargo by benefiting from the response to internal stimuli such as pH changes and redox gradient and external stimuli such as temperature, electric field, magnetic field and light, and also increases the amount of drug absorption at the target site. This sensitivity to internal and external stimuli can be made by using materials such as polymers that change their characteristics as a function of signal intensity and have the possibility of using this change in the drug delivery system. However, the main challenge for the use of this system is the accurate assessment of the toxicity of the substances used and the lack of a clear connection between preclinical and clinical studies, which is a big problem for obtaining legal permits. In this review, we discuss the principles of intelligent drug delivery system and how to respond to stimuli.

Self-assembly of polymethyl methacrylate microcapsules using reversible addition-fragmentation chain transfer (RAFT) polymerization

Fatemeh Askari،.Majid Safajou Jahankhanemlou* ،Ali Nematollahzadeh

Abstract

In this study, the new method of transfer polymerization to reversible addition-detachable chains using self-assembly polymerization has been investigated. Heterogeneous reversible fragmentation transfer-transfer (RAFT) polymerizations can be performed via a polymerization-induced self-assembly (PISA) mechanism. The polymerization of the monomer in the reaction medium spreads in the form of a chain, and then the block copolymer continues to form nanoparticles by self-assembly. A wide range of nanoparticles in terms of dimensions and geometric shape (hollow, spherical and rods) can be prepared with PISA and RAFT technique in high solid content (around 50%). There are many applications of these particles in the field of drug delivery, energy storage, and biomedicine.

key words: Surface self-assembly, polymerization, methyl methacrylate, reversible addition-detachable chain transfer polymerization

The design of bio-nanosensor based on 35S promoter sequence for detection of nuclear transgenic plants

Mahin kazemi*, Farrokh Karimi, Saber Golkari

Abstract

Nuclear transgenic plants are plants whose genomes have been modified using genetic engineering techniques to increase the efficiency of the plant to improve performance and resistance to living and non-living stresses and for other purposes in plant biotechnology.In recent years, according to the increase in the cultivated area of these plants and the existing concerns in the field of their safety, a lot of research has been done in order to identify and label them. The use of nanotechnology has caused a revolution in the diagnostic methods of plants. In this project, a nanobiosensor based on carbon nanoparticles was designed to identify transgenic plants. After the synthesis of nanoparticles, specific labeled probes were designed for S35 sequence. After designing, the probe factors such as the time of connecting the probe to carbon nanoparticles and different concentrations of carbon nanoparticles were optimized. The results showed that the nanosensor can detect the transgenicity of the nuclear transgenic plant up to the concentration of 2 µg / µl.

Keywords: *nuclear transgenic plants, PCR, biosafety, bio-nanosensor*

Optimization of DNA sequence stabilization of NOS terminator on the surface of carbon nanoparticles

Mahin kazemi*, Farrokh Karimi

Abstract

Today, a lot of research is being done to use nanotechnology to design and build diagnostic methods in biological sciences. Carbon nanoparticles are important nanomaterials that are used in the design of nanosensors to identify biological molecules. The NOS terminator is one of the gene sequences that is used for plant cell transformation. In this project, in order to design a nanosensor to identify transgenic plants, the labeled probe sequences related to the NOS terminator were fixed on the surface of carbon nanoparticles by covalent and non-covalent methods. In stabilization reactions, time factors and concentration of carbon nanoparticles were optimized. The results showed that the covalan method is more efficient than the non-covalan method in the quenching of the fluorescence emission of the NOS terminator-labeled probe.In the optimal results, the duration of 12 minutes and the concentration of carbon nanoparticle $20_{\mu g/\ \mu l}$ were determined as the optimal conditions for the stabilization reaction. Finally, the results of this research showed that the Covalan method is the most effective method for stabilizing DNA oligonucleotides in the design of DNA Nano sensors.

Key words: stabilization reaction, DNA probe, carbon nanoparticles

A review on synthesis and applications of palladium magnetic nanoparticles

Vahid Azizi*[1], Payman Hashemi[2], Hamed Karami[3], Vida Shiri-Ghaleh[4], Mehrdad Moradi[5]

Abstract

Magnetic nanoparticles are a group of nanomaterials that are made of natural magnetic materials such as iron and cobalt and are affected by magnetic fields. Today, the use of magnetic nanoparticles has been widely used in various sciences such as separation, catalysts, targeted drug delivery and medicine. In the preparation of magnetic nanoparticles, there are different kind of challenges such as; the size and shape of nanoparticles, the level of stability and environmental effects. In this article, the method of synthesis, stabilization and application of magnetic nanoparticles is investigated and at the end, palladium magnetic nanoparticles are introduced. Due to the synthesis and wide application of various types of magnetic nanoparticles, the use of palladium magnetic nanoparticles as a catalyst has become very common.

Keywords: Magnetic nanoparticles, palladium, co-precipitation

1. Department of Chemistry, Faculty of Science, Lorestan University, Khoramabad, Iran
2. Department of Chemistry, Faculty of Science, Lorestan University, Khoramabad, Iran
3. Department of Petroleum Engineering, College of Engineering, Knowledge University, Erbil, Iraq
4. Department of Basic Sciences, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran
5. Legal Medicine Research Center, Legal Medicine Organization, Tehran, Iran

Introducing aerogels and investigating their use

Amir mohammad Bahrami maddah[1*], Khodavirdi Abbaszadeh Maroufan[2], Mohammad Salehi Avval[3]

Abstract

Aerogels are gels with nanometer holes, low density, porosity and high internal area. Due to these features, aerogels are widely used in applications that require sound insulation as well as high light transmission. The process of aerogel synthesis consists of two stages: in the first stage or the stage of making the gel, the solvent penetrates the gel, and in the next stage, the solvent is removed or dried. In general, the word aerogel refers more to the internal structure of the material than to its constituent materials; Therefore, it is possible to synthesize aerogels by a wide range of raw materials with different chemical composition. Among the raw materials used for the synthesis of aerogels, we can mention mineral, organic and composite materials. In this article, aerogels are briefly introduced and their properties are discussed. Then, the methods of synthesis of aerogels, as well as the types of aerogels according to their raw materials, will be studied in detail. Finally, the most important applications of aerogels will be introduced.

Keywords: Aerogel, nanotechnology, application of aerogel, Nano cavities.

1. Master student of chemistry, Farhangian University, Tabriz, Iran
2. Instructor of the Basic Sciences Department of Biology, Farhangian University, Allameh Amini Campus, Tabriz, Iran
3. Master student of chemistry, Farhangian University, Tabriz, Iran

Liposome and their application in drug delivery

Aida Zahedi no[1*], Amir mohammad Bahrami maddah[2]

Abstract

A liposome is a microscopic vesicle containing a phospholipid bilayer that surrounds a fluid space. The thickness of this bilayer lipid is usually between 3 and 6 nm, but the liposomes formed from them can have a diameter between 50 nm and 50 micrometers. Due to the amphipathic properties of its components, liposomes provide the possibility of drug delivery of both hydrophilic and hemilipophilic drugs. Features such as low inherent toxicity, biodegradability and lack of immunogenicity have caused liposomes to be considered as a very suitable carrier in modern drug delivery systems. These small bag-like structures are similar to packages or capsules that can be used to transport drugs to different parts of the body by encapsulating them. As a result, drug delivery is one of the important applications of liposomes. In this article, due to the high importance of new drug delivery systems based on liposomes (liposomal drug delivery), we first look at the history of liposomes, then at the structural features, synthesis methods, types of surface modifications of liposomes for different purposes, and the classification of liposomes based on different methods. , and the methods of identifying the characteristics of synthetic liposomes, and in the next parts, we will discuss the various applications of liposomes in medicine and especially in drug delivery, And finally, we will examine the advantages and disadvantages of these drug delivery systems based on liposomes.

Keywords: Liposome, drug delivery, vesicle, nanotechnology.

1. Bachelor of Veterinary Medicine, Islamic Azad University, Sanandaj branch, Kurdistan, Iran
2. Master student of chemistry, Farhangian University, Tabriz, Iran

Introducing aerogels and investigating their use

Amir mohammad Bahrami maddah[1*]

Abstract

Aerogels are gels with nanometer holes, low density, porosity and high internal area. Due to these features, aerogels are widely used in applications that require sound insulation as well as high light transmission. The process of aerogel synthesis consists of two stages: in the first stage or the stage of making the gel, the solvent penetrates the gel, and in the next stage, the solvent is removed or dried. In general, the word aerogel refers more to the internal structure of the material than to its constituent materials; Therefore, it is possible to synthesize aerogels by a wide range of raw materials with different chemical composition. Among the raw materials used for the synthesis of aerogels, we can mention mineral, organic and composite materials. In this article, aerogels are briefly introduced and their properties are discussed. Then, the methods of synthesis of aerogels, as well as the types of aerogels according to their raw materials, will be studied in detail. Finally, the most important applications of aerogels will be introduced.

Keywords: Aerogel, nanotechnology, application of aerogel.

1. Master student of chemistry, Farhangian University, Tabriz, Iran

Surfactant/Tocopherol-based oil nano-droplets: synthesis, Dynamic light scattering and DST

Narges Ajalli[1] ,Abbas Rahdar [2,*],

Abstract

In the current work, oil-in-water F127-based microemulsions used to synthesis oil nano-micelles including drug at an oil-to-surfactant molar ratio of 1 (O_w = [oil]/[F127]=1) and oil nano-droplet mass fraction (MFD) values between 0.01-0.1 by means using dynamic light scattering (DLS) and dynamic surface tension (DST) techniques. DLS data showed that the droplet size decreased with MFD. At the same time, DST data revealed that surface tension reached much faster the thermodynamic equilibrium upon variations of the mass fraction of the oil nano-droplets.

Keywords: F127, dynamic light scattering, microemulsion.

1. School of Chemical Engineering, College of Engineering, University of Tehran, Tehran 1417935840, Iran,
2. Department of physics, Faculty of Science, University of Zabol, Zabol, Iran

Investigation of hydrogel nanocomposites and their application in Bone tissue engineering

[1]Mahya keshavarz Sedigh[*2], Mohsen Mohammadi [3], Fatemeh Savojbolaghi [4]

Abstract

Hydrogels are ideal for medical applications due to their high biocompatibility, high water absorption and good performance. However, these materials are less used in tissue engineering due to their relatively low mechanical strength. Tissue engineering is recognized as one of the most important disciplines in reconstructive medicine, which combines scaffolding and cell transplantation to develop alternative tissues or promote tissue regeneration. Today, nanocomposite hydrogels with high mechanical properties and some unique properties such as electrical conductivity, antibacterial, antioxidant properties, magnetic response and very suitable response to internal and external stimuli have been introduced as an emerging and creative material. They provide a new opportunity to make hydrogels with excellent properties. Nanocomposite hydrogels can mimic the microenvironment of human bone tissue cell matrix. In this study, we summarize the properties of hydrogels in nanomedicine and the applications of hydrogel nanocomposites in tissue engineering.

Key words: Hydrogels, hydrogel nanocomposites, nanomedicine, tissue engineering, Nanoparticle

*keshavarzsedigh.m@qut.ac.ir

2. Department of Polymer Engineering, Qom University of Technology
3. Department of Polymer Engineering, Qom University of Technology
4. Department of Polymer Engineering, Sahand University of Technology

Preparation of Nano Praseodymium cerate Ceramic Powders via an Easy Way

Sahar Zinatloo-Ajabshir[1*]

Abstract

In this research, nano praseodymium cerate ceramic powders were synthesized by a new and easy method. To find the optimal conditions for the synthesis of nanopowders, the influence of some fabrication parameters was examined. The findings of this work represented that the grain size and morphology of nano praseodymium cerate ceramic powders were notably affected through the examined parameters. The as-prepared praseodymium cerate were characterized by FT-IR, FESEM, EDS and XRD. The obtained findings showed that with the aid of this new method can be produced relatively uniform sphere-like praseodymium cerate nanostructures. In addition, the photocatalyst performance of as-synthesized praseodymium cerate was checked through removal of the toxic organic contaminant under visible light.

Key words: Nanostructure, Ceramic, Praseodymium cerate, FESEM, Photocatalytic capability.

1. Department of Chemical Engineering, University of Bonab, P.O. Box. 5551395133, Bonab, Iran, (S. Zinatloo-Ajabshir)

Molecular dynamics study on loading of methotrexate anticancer drug on the chitosan surface modified carbon nanotube

Leila Tohidifar[*,1], Farzaneh Rahimi[2], Mohammad H. Kowsari[*,3]

Abstract

With recent advances in CNT-based targeted drug delivery systems, the importance of biologically compatible agent choosing for modification of them to increase the drug uptake in the loading stage and drug release at the target sites is more prominent. Herein, systems based on the pristine and chitosan biopolymer-modified single-walled carbon nanotubes (SWCNTs) for delivery of methotrexate (MTX) anticancer drug were designed and the loading mechanism of MTX molecules on the SWCNT, as well as their interactions with nano-carriers and drug loading quality were evaluated at 310 K using molecular dyamics (MD) simulations. All simulations were performed by the GROMACS 5.0.4 package. According to the results, MTX molecules had strong affnity toward the nano-carrier, mainly dominated by vdw interactions and π-π stacking of their amino pteridine and benzene ring of amino benzoic acid moieties. For the modified system, coverage of the nano-carrier surface with chitosan decreased the MTX-SWCNT interactions in the outer wall of SWCNT. However, due to the high number of functional groups of chitosan and the resulting H-bonds with MTX molecules, polymer caused to the effective adsption of drug agents on the surface of chitosan-SWCNT. These simulation findings can be expected to be useful for designing and development of MTX drug delivery systems.

1. Department of Chemistry, Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan
2. Department of Chemistry, Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan
3. Department of Chemistry, Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan
Center for Research in Climate Change and Global Warming (CRCC), Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan

PCR-Based Study for Molecular Documentation of Neuropersistence of Human Herpes Virus Type - 6 in a Group of Patients with Brain Cancers in Mid-Euphrates Sector of Iraq

Zahraa Ali Abdullah[1]; Shakir H.Mohammed Al-Alwany[2] ; Saad Hasan Mohammed Ali[3]

Abstract

Background: The extent of tissue tropism in persistent Human Herpesvirus-6 (HHV-6) infection is not known but this virus has predominantly localized in T- lymphocytes. Recently, researches have reported glial tropism of HHV-6 in neural tissues and an association with a diverse spectrum of CNS diseases, including tumors. **Objective:** Investigate the neuropersistence- detection rate of HHV-6 along brain tumorigenesis in a series of brain tumor tissues of a group of Iraqi patients in Mid-Euphrates Sector/ Iraq. **Patients and methods:** Seventy freshly obtained- brain tissues were enrolled in this study; (50) were brain cancer biopsies and (20) autopsies obtained from apparently normal brain (as a control group). Conventional PCR was chosen for the detection of HHV-6. **Results:** According to PCR detection, 12 out of 30 (40%) of the specimens revealed PCR detection positivity for HHV-6, while 18 out of 30 (60%) specimens showed negative-detection for HHV-6. The brain tumor tissues which were most HHV6- infected are related to the age stratum (21-40 years), accounted for 8 % , while the age strata (3- 20 years), (41-60 years), and (61-80 years) each accounted for 6 %; 6% and 4 %, respectively. The percentage of brain tumor tissues that have positive HHV-6 PCR results according to the gender of patients, where the males accounting for 66.7% (8 out of 12 cases) and females accounting for 33.3% (4 out of 12 cases). Positive HHV-6-PCR detection results in brain tissues from patients according to various types of brain tumors were 8%, 6%, 6%, 2%, and 2% in Glioma; Oligodendroglioma; Ganglioglioma; Meningioma, and Medulloblastoma,

1. College of Science , University of Babylon , Iraq
2. College of Science , University of Babylon , Iraq
3. College of medicine , University of Baghdad, Iraq, Baghdad

respectively.**Conclusion:** In view of the relatively small numbers included in our study, the present results indicate the possibility that HHV-6 may play a role in the tumor biology of the examined subset of brain tumors and may contributed to their development.

Key word: HHV-6; Brain Tumors, Glioma; Oligodendroglioma; Ganglioglioma; Meningioma, and Medulloblastoma; PCR.

Evalution of cytotoxicity of chitosan nanoparticles synthesized using *Lepidium Sativum* seeds

Nuha Yaarub Al-Harbi and Faris Naji Abood alhadi[1]

Abstract

The biosynthesis of nanoparticles is widely considered today. This investigation was aimed at the biosynthesis and coating of chitosan nanoparticles of Lepidium Sativum seed extract and the assessment of its cytotoxicity-promoting effects.

Our in vitro study aimed to evaluate the potential impact of Lepidium sativum on healthy15P-1 Sertoli cells and HLC Leydig cells, concerning basal parameters such as cell viability, reactive oxygens species generation (ROS), Malondialdehyde (MDA) concentration, and caspase-3 activity after 48 hrs stimulation .Exposure to ethanolic LS extract and 43.72 nm CS-LS NPs for 48hs at dosage levels between 50 and 800µg/ml decreased cell viability in a dose-dependent manner. The ethanolic LS extract caused the death of healthy HCL cells, with an inhibitory concentration (I C50) of 416.4 µg/ml. Also, the ethanolic LS extract also showed a toxic effect in healthy 15p-1cells at(IC50=476.7µg/ml). Further experiments performed with HCL cells after exposure to 43.72nm CS LS NPs with IC50=1172 caused cell death and IC50= 1167 µg/ml caused the death of 15p-1cells.

Also, exposure of these cells to different doses of extract and nanoparticles increased malondialdehyde release after treatment of HLC cells indicating lipid peroxidation and membrane damage. In summary, exposure to ethanolic LS extract and 43.72 nm CS-LS NPs results in dose-dependent cytotoxicity in cultural cells that are closely correlated to increased of malondialdehyde (MDA)and caspase-3 activity for HLC cells.

These investigations will aid in drawing attention to L. sativum, may be helpful in creating new formulations with more medicinal potential, and will offer guidance for future studies.

Keywords**:** Leydig cells ; sertoi cells ; Lepidium sativum ; nanoparticles ; cytotoxicity ; viability; reactive oxygen species; malondialdehyde ;caspase-3

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1. Department of Biology, College of Science, University of Babylon,Iraq

Review on immobilization of enzymes on nanofibers fabricated by electrospinning

Shaghayegh Sheikhzadeh*[1], Mohammad Alizadeh Khaledabad[2], Hadi Almasi[3]

Abstract

The performance of the immobilized enzyme depends on the type of substrate and immobilization method. Nanostructures are considered good substrates for enzymes due to their advantages regarding enzyme immobilization. The advantages of nanostructures for immobilization were effective enzyme loading, minimizing the difficulty of substrate access to enzymes, and their high surface-to-volume ratio, which leads to higher biological activity. Compared to other nano-substrates (such as silica and nanoparticles), nanofibers provide promising results due to their high porosity, interconnectivity, and reusability due to easy separation from the reaction mixture as a substrate for enzyme immobilization. In this article, the recent advances in the use of nanofibers as a substrate for enzyme immobilization with two main methods, encapsulation and surface attachment, have been discussed. Encapsulation means electrospinning a mixture of enzyme and polymer. Surface attachment refers to physical adsorption, covalent attachment, or cross-linking of enzymes on simple or modified nanofibers. In this article, we made a detailed comparison between these two methods of immobilization and discussed the advantages and disadvantages of each method.

1. Department of Food Science and Technology, Faculty of Agriculture, Urmia University
2. Department of Food Science and Technology, Faculty of Agriculture, Urmia University
3. Department of Food Science and Technology, Faculty of Agriculture, Urmia University

Familiarity with quantum dots and investigation of carbon and graphene quantum dots

Amir mohammad Bahrami maddah[1*], Masoud saadati [2]

Abstract

Quantum dots are semiconductor nanocrystals (around 1-10 nm). Quantum dots are widely used in light emitting diodes, lasers, imaging of living organisms and solar cells. Properties of Fluorescent Carbon Nanoparticles or Carbon Quantum Dots (CQDs) and Graphene Quantum Dots are a new class of carbon nanomaterials that have emerged recently and are considered as potential competitors of semiconductor quantum dots due to the favorable advantages of low toxicity, environmental compatibility, low manufacturing cost. Are. In this article, quantum dots are briefly introduced and their optical properties are discussed. Then, various synthesis methods, surface chemistry of quantum dots, as well as the toxicity and applications of these dots will be studied in detail. In order to make two categories of carbon nanomaterials, synthesis methods, characterization methods and application of carbon quantum dots and graphene are investigated.

Keywords**:** Quantum dots, nanotechnology, carbon, graphene.

1. Master student of chemistry, Farhangian University, Tabriz, Iran
2. Department of Basic Sciences, Farhangian University, Tabriz, Iran

Examining Students' Misconception in Learning Thermodynamics

Mohammad Salehi Avval*, Amirmohammad Bahrami Maddah[1]

Abstract

The studies conducted on the nature and environment of learning show that the researches conducted in this field are mostly focused on external factors affecting learning such as teaching methods, strategies, teachers' qualifications, textbooks, educational contents and classroom environment. One of the reasons for creating misunderstandings in students is the existence of similar misunderstandings in teachers, so it is necessary to identify and correct the misunderstandings of students and teachers. Heat and energy are two main concepts in thermodynamics. This review article showed that the use of incorrect words and textbooks are factors that cause misunderstanding. The general expression of the entropy function macroscopically without addressing the molecular structure and molecular theories also causes misunderstandings and a wrong understanding of it. It is not possible for a student to learn a subject only through its general expression, but the learning of any subject depends on the initial beliefs and thoughts recorded in the mind, and if it is stated incorrectly, it will definitely be much more difficult to learn that subject in the future.

Key words: Thermodynamics, Misconception, Physical Chemistry, Education.

1. Bachelor student of Chemistry Education, Farhangian University,Tehran, Iran.

Removal of direct yellow 12 dye from aqueous solution by the pumice powder/MnO_2 nanoparticles composite ($PP\text{-}MnO_2$)

Hamid reza jafari*[1], Alireza ahmadzadeh goli[2], Ali ayyubi[3]

Abstract

The development of various industries has caused the production of large amounts of polluted effluents and their entry into the water network. Considering that taking care of natural resources is one of the primary requirements for human health and the needs of future generations, the production of wastewater should be reduced and their discharge into the environment should be prevented. One of the most important environmental pollution factors is the textile industry, which produces a high amount of colored wastewater. Most of the dyes used in this industry are not biodegradable and are carcinogenic, mutagenic, and toxic, and by preventing the passage of light, they disrupt the photosynthesis process. The porous structure of mineral pumice and their high surface-to-volume ratio have created the ability to absorb different substances in them. Also, due to the porous structure of manganese dioxide nanoparticles and its high absorption capability, using potassium permanganate precursor, manganese dioxide nanoparticles were synthesized in situ on the powder of mineral pumice and this composite was used to remove direct yellow 12 dye. Using FESEM and EDX tests, the presence and uniform distribution of nanoparticles was proven. The prepared composite showed a high adsorption capacity for color removal, and the Langmuir adsorption isotherm and pseudo-second-order kinetic model showed the best fit with the experimental data. Therefore, this composite can be used as a cheap adsorbent with high efficiency to remove colored pollutants from wastewater.

Keywords: Wastewater treatment, Dye pollutants, Pumice stone, MnO_2 nano particels, Adsorption isotherm and kinetic

1. Department of Textile Engineering, Amirkabir University of Tecnology (Tehran Polytechnic)
2. Department of Textile Engineering, Amirkabir University of Tecnology (Tehran Polytechnic)
3. Department of physics, University of Zanjan

Fabrication of ZnO NW /WS_2 nanocomposite as photoanod for dye-sensitized solar cells (DSSCs)

Majid R. Al-bahrani[1]

Abstract

This paper presents the preparation of a nanocomposite compound from tungsten sulfide. Then used the resulting compound as a photoanode for the DSSC cell after treating it with WS_2 by hydrothermal method and comparing it with DSSC cell based on ZnO NW as photoanode. The crystal structure of the basic materials and the prepared ZnO NW/WS_2 nanocomposite have been studied using X-ray diffraction XRD, and the SEM and TEM examination. The physical and chemical properties have proved that the nanocomposite (ZnO NW /WS_2) has been produced within a nanoscale. The regular and pure WS_2 nanoparticles are successfully installed on the nanocomposite and exhibit a high surface area and pore size(10µm) when compared to pure WS_2 NP. The ZnO NW /WS_2 nanocomposite compound exhibits a PCE conversion efficiency (8.799%), which is relatively high if compared to ZnO NW Pure (7.978%). The reason for improving the PCE of (ZnO NW /WS_2 NC) is that the presence of WS_2 in the compound reduces the time to reconnect the electron-hole pair and efficiently stabilizes the WS_2 assembly to expose the entire active edges. On the other hand, giving an increase in electrical conductivity facilitates electron transfer inside the compound. Also, the presence improves the ability of the compound to absorb the photon and thus increases the photoelectric stimulation.

1. Laboratory of Nanomaterial and Plasma, College of Science, University of Thi-Qar, Thi-Qar, Iraq.

A comprehensive study on the cooling system effect on Spark Ignition Engines performance with ethanol-gasoline blends

Mubeen Hekmat Abbas [1], Mustafa Ali Abdulridha[2]

Abstract

This extensive study examines how the cooling system affects the performance of spark ignition engines that burn an ethanol-and-gasoline blend. The study was examined through a series of tests that were performed on a 1.6-liter, four-cylinder engine with a 10.5:1 compression ratio. Different cooling system configurations, including a traditional cooling system and an advanced cooling system with a variable-speed water pump, were used to test the engine. The study also looked into how the ethanol-gasoline blend affected the engine's output and emissions. According to the findings, running on a mixture of 20% ethanol and 80% gasoline reduced the engine's power output by up to 4.2% when compared to pure gasoline. However, the ethanol-gasoline blend increased the engine's fuel efficiency by up to 4.8 percent. The study also discovered that while using the ethanol-gasoline mixture, the engine's NOx and CO emissions rose by up to 11.2 percent and 7.6 percent, respectively. Finally, the study assessed how the cooling system affected the engine's combustion properties, such as the timing of the ignition and the length of the combustion. The outcomes demonstrated that the engine's combustion characteristics were improved by the modern cooling system with a variable-speed water pump, resulting in a more effective and clean combustion process. The study's findings demonstrated that the modern cooling system with a variable-speed water pump significantly improved the performance of the engine. The innovative cooling system increased the engine's power output by up to 5.3 percent while increasing its fuel efficiency by up to 6.7 percent over the standard cooling system. The study also discovered that the sophisticated cooling system assisted in lowering the engine's NOx

1. Babol Noshirvani University of Technology (NIT) , Mechanical Engineering department, Iran.
2. Babol Noshirvani University of Technology (NIT) , Mechanical Engineering department, Iran.

and CO emissions by up to 12.6 and 9.8 percent, respectively. Overall, this thorough investigation offers insightful information about the impact of the cooling system on the operation and emissions of spark ignition engines using an ethanol-gasoline blend. The results of the study indicate that a sophisticated cooling system with a variable-speed water pump can greatly enhance engine performance and lower emissions. The findings of the study can guide the creation of more effective and environmentally friendly engines for the automobile sector.

New Compounds Based on Anthracene for Organic Solar Cell.

Sadiq Abbas Fayhan[1], Nidhal Mohammed Al-Shareefi [2], Mohsin K. Al-Khaykanee [3]

Abstract

The current research includes proposed new organic compounds based on the Anthracene molecule for the synthesis organic solar cells .The studied compounds were designed by Gauss View 5.0.8 program, by applying the hybrid function B3LYP from the theory of density function with the basic functions 6-31G, the ground state and spectral properties of the studied compounds was studied, also time-dependent density function theory was applied to study the properties of the excited states for the studied compounds, several donors and acceptors group were added to the anthracene molecule with/without anchor atom (carbon atom), as well as molecule of titanium dioxide with symmetric and asymmetric bonds. The results demonstrated that these molecules can be used as organic sensitizers in solar cells because of the possibility that they will inject electrons into the conduction band of PC60BM or TiO2, in addition to the compounds' support in developing more functional and effective organic photovoltaic materials.

1. University of Babylon/College of Science/ Department of Physics
2. University of Babylon/College of Science/ Department of Physics
3. University of Babylon/College of Science/ Department of Physics

Laboratory evaluation of refractory mass performance improvement with nanoporous aerogel additive

shiva Farshadfar ,dr Hasan Bargozin ,Mahdis Mohiti ,dr Taher Yousefi Amiri

Abstract

With the increasing need for energy efficiency and resource conservation, as well as improved safety measures for equipment and buildings in case of fire, there is a growing demand for research in the production of non-flammable materials. Refractory masses, commonly used as spray insulation in industry and construction, are a promising avenue for improvement. This study aims to optimize refractory masses through the use of nanotechnology, specifically by incorporating a nanoporous material known as silica aerogel. Various percentages of silica aerogel were added to the refractory mass composition, and 15 x 15 cm molds with a thickness of 0.4 cm were prepared and tested for thermal resistance. Direct peak flame experiments were conducted to simulate industrial fire environments, and temperatures were measured using a two-channel digital thermometer. Results showed that adding aerogel in all percentages led to a noticeable increase in thermal resistance and a decrease in energy loss. Furthermore, due to the low density of aerogel, adding it to the refractory mass structure resulted in a significant reduction in weight. This promising finding could ultimately reduce the weight of insulation on equipment, improving safety and efficiency in industry and construction.

Adsorption of acetaldehyde molecule on SiC_2 monolayer: An ab initio study

Khalil Seidali Javanmardi, Zahra Karami Horastani*[1]

Abstract

The main purpose of the present article is an investigation of the structural and electronic properties of SiC_2 monolayer in presence of acetaldehyde molecule, using the density functional theory. The adsorption energy related to the optimal structure showed that the acetaldehyde molecule is physisorbed on SiC_2 with an energy of 0.310eV. The electronic band structure as well as densities of states are calculated and from which we conclude that the band gap and the distance between the Fermi level and minimum of the conduction band increase slightly after acetaldehyde adsorption which can reduce the layer conductivity. According to the obtained results, the SiC_2 monolayer can be used as an acetaldehyde detector based on the heat of reaction (calorimetric) and the conductivity change (resistive sensor). However, according to the obtained results, pure SiC_2 monolayer has poor performance as an acetaldehyde sensor, which should be improved by adding appropriate impurities or creating defects in the SiC2 structure.

keywords: SiC_2, Acetaldehyde, Density Functional Theory

1. Department of Electrical Engineering, Shiraz Branch, Isalimc Azad university, Shiraz, Iran

Structural and electronic properties of two-dimensional materials Ge_4P_2 and Ge_4As_2 in the presence of electric field

Farnaz Samavati[1], Shoaib Babaei Toski[2]

Abstract

In this article, the structural and electronic properties of two-dimensional materials with the formula M_4X_2 (M=Ge, X=P, As) with honeycomb structure are investigated for the first time. The structural and electronic characteristics of the monolayers of these materials are theoretically investigated using density functional theory. First, in the absence of an electric field, the electronic properties of Ge_4P_2 and Ge_4As_2 monolayers are calculated, then the electronic field is applied and the change of the bandgap in the electric field is investigated. The band structure for these materials is obtained along high symmetry points. Monolayer Ge_4P_2 and Ge_4As_2 are semiconductors with a low bandgap. Finally, the contribution of the effective orbitals are investigated through the density of states.

Keywords: Two-dimensional materials, electron density, anisotropy, band structure, electronic properties, graphene, dynamic stability, density functional theory.

1. MSc student in electrical engineering (micro and nano electronic devices) Hamedan University of Technology, Hamedan, Iran

2. Assistant Professor of Electrical Engineering Department, Hamedan University of Technology, Hamedan, Iran

Researching the scientific productions of Nanotechnology in the Scopus

Ensieh Farahmandzad, Seyed Sajjad Afsariyan

Abstract

New technologies, as key technologies and the axis of sustainable development, play a very important role in determining the scientific, economic and strategic position of countries in relation to each other. For this reason, many countries have allocated a major share of their scientific, research and innovative activities to the acquisition and development of new technologies in order to maintain their independence and enter the market to compete with others. Nanotechnology is also one of the key technologies that can have a tremendous impact in various fields of economy, health, environment, etc. of countries. Attention to the field of nanotechnology is increasing day by day in developed and developing countries. The purpose of this research is to investigate the statistics of scientific production of nanotechnology in Iran compared to other countries in the world, which was extracted based on the Scopus from 2013 to 2022. The results of this research show that Iran ranks 10th among the countries of the world in terms of scientific production of nanotechnology with a number of 1359, which is very important in its own way. China is in the first place with the highest number (11018 cases), and the countries of America and India are in the second and third places.. In general, the results of this monitoring show that the amount of studies conducted in Iran and the world indicates an upward trend during the last ten years.

Keywords: Scopus, nanotechnology, scientometrics, scientific productions

Tuning the bandgap of antidote vacancy armchair Germanene nanoribbon by applying electric field

Fahimeh Behzadi[1]

Abstract

After the success of graphene and its applications, scientists pay attention to the 2D structures. One of them is germanene in fourth column of period table as graphen, but its structure is buckled not flat. It is possible to fabricate nanoribbone by cutting germanene. According to the direction of cutting, we have armchair or zigzag nanoribbons. In this article, electronic properties of armchair germanen nanoribbons with defect of antidote Ge vacancy and under electric field is investigated through density functional theory. The generalized gradient approximation (GGA) is used for exchange–correlation functional of Perdew, Burke and Ernzerhof (PBE). At first, we optimized H hydrogenated armchair germanene nanoribbons with 13 atoms ribbon width. To fabricate the structure with vacancy, the optimized structure with 104 atoms of Ge is chosen where 12 Ge atoms are omitted in an antidote pattern. The new active bonds due to omitting atoms are passivized with H atoms and optimized again. According to the total energy of structures, both the pristine and vacancy structures are stable. It is interesting that the vacancy structure is more stable than the pristine one. The bandgap of antidote vacancy germanene nanoribbone increases in comparison to the pristine one. In addition, it is possible to tune the bandgap by applying perpendicular electric field. It is observed that by increasing the electric field to the specific value, the bandgap increases and after that decreases to the very small value. We can use this property in electronics devices.

1. Department of Physics, Faculty of Science, Fasa University, Fasa, Iran

Investigating the effect of nano silica additive in improving the performance of two types of silicone and non-silicone antifoam

Saeed Iranpour[1]*, Masoud Kambarani, Mahdi Rouzbahani, Ramin Hosnan

Abstract

Antifoams are one of the most critical chemicals in various industries. Considering that the production of antifoam is necessary for many industries due to foam production processes, improving the performance of antifoams can help reduce costs and increase productivity in industries. This study investigated the effect of nano-silica additive in two samples of non-silicone and silicone antifoams. Using the foam system based on an anionic surfactant, performance tests of antifoams were performed. The results showed that using nano-silica additive improves the performance in reducing the amount of foam in both antifoams. However, performance improvement in Silicone antifoam is more commonly observed. In the case of using silicone antifoam, using a nano-silica additive will improve the performance more.

Keywords: nano-silica, antifoam, antifoam, silicone antifoam, non-silicone antifoam

1. ⁕University of Tehran, Faculty of Engineering, ACECR, Farayand Chemical Research Group.

Application of polymer nanocomposites containing carbon nanotubes in industrial wastewater treatment

Batool Tahamipour[1*], Keyhan Javedan[2], Amir-Parsa Darijani[3], Shervin Zia-Ali[4]

Abstract

Separating and purifying water from all kinds of pollutants has been a challenging issue for industries in recent years, which requires new scientific ideas and techniques. One of the most important issues in this field is the separation of color pollution from the water and oil mixture created in the petrochemical, leather, textile, food industries, etc., which is increasing rapidly. In this context, membrane filtration methods are receiving attention today due to their high efficiency, cheap price, and use in the treatment of various types of industrial wastewater. In this project, a new nanocomposite filter has been designed and manufactured using nanofibers containing carbon nanotubes and is used to separate color from water. The results show that the structure of this filter has high porosity and the presence of fibers around 40 nm in the sample can be well recognized. Also, the results of using this filter in color separation show that this filter has a good ability to remove all kinds of colored materials. Therefore, this filter can be used to separate and remove water pollution in various industries.

Key words: nanocomposite, purification, carbon nanotube, wastewater, polymer

1. Khayyam Student Research Center, two District Education, Kerman
2. Sharif High School, Kerman
3. Sharif High School, Kerman
4. Sharif High School, Kerman

Simultaneous optimization of gel polymer electrolyte and counter electrode to improve performance of dye-plasmonic nanostructure solar cell

Susan Abbas Nejad[*1], Hosein Rooholamini Nejad[2],Vahid Saheb[3], Hamideh Hasanzadeh Jeshari[4]

Abstract

In this study, a gel polymer electrolyte is prepared by mixing lithium iodide and iodine with citric acid and starches with glycerol as the plasticizing agent. This electrolyte can easily be placed in the vicinity of TiO_2 photoanode and dye to play the role of hole transporter in the cell. Due to less evaporation, the stability of the cell based on this electrolyte increases. For further optimization, a suitable counter electrode was made based on Au and Pt nanoparticles and performance was investigated in presence of the new gel electrolyte. The results show that stability increases in the presence of gel electrolyte compared to liquid electrolyte. Also, due to increase the efficiency and better compatibility of the gel electrolyte in the cell, Au and Pt nanoparticles were used simultaneously in the counter electrode, which improved electron transfer and decreased cell resistance through the mechanism of generating cascade energy levels, which resulted in increased cell performance.

Keywords: Gold nanoparticles, Nanostructured solar cell, Gel electrolyte, Stability

1. Department of Physics, Shahid Bahonar University of Kerman, Kerman, Iran
2. Department of Physics, Shahid Bahonar University of Kerman, Kerman, Iran
3. Department of chemistry, Shahid Bahonar University of Kerman, Kerman, Iran
4. Department of Physics, Shahid Bahonar University of Kerman, Kerman, Iran

Calculating the structural, mechanical and thermodynamic properties of nickel and investigating the effect of vacancy point defects by molecular dynamics simulation method

Amir Alivaliollahi, Ghasem Alahyarizadeh*, AbdolHamid Minuchehr[1]

Abstract

Nickel metal is a transition metal with high resistant to corrosion and has high strength even at high temperatures. In recent years, Nickel metal and Nickel based alloys have been widely used in various industries such as oil and gas production industries, chemical and petrochemical industries, aerospace industry, solar energy conversion, nuclear industry, etc. The crystal of this kind of metal in harsh operational environments leads to the creation of various structural point defects such as vacancy, substitution and interstitial. The existence of these structural defects have a great impact on various mechanical, structural and thermodynamic properties. One of the most appropriate methods for calculating the material properties is the use of computer simulation methods, including the molecular dynamics method. In this study, the effect of vacancy defects on various mechanical, structural and thermodynamic properties of nickel metal has been investigated by using the molecular dynamics simulation method. The obtained simulation results show that the presence of the vacancy defect in the nickel crystal has reduced the lattice constant, density, bulk, shear, and Young's moduli, hardness, Debye temperature and minimum thermal conductivity, while Poisson's ratio, Pugh's ratio, Cauchy pressure and anisotropy increases by vacancy.

Keywords: nickel metal, molecular dynamics simulation, vacancy defect, mechanical properties, thermodynamic properties

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1. Faculty of Engineering, Shahid Beheshti University, 1983969411, Tehran, Iran.

Preparation of nano wound dressing using biopolymers and its application in wound healing

Batool Tahamipour[1], Mojtaba Zandi, Aria Hosseini-Nasab[2]

Abstract

Wound treatment and care of damaged body tissue has always been one of the main challenges of the medical field. Wound healing is a complex and dynamic process that accelerates and promotes the preparation of a suitable environment. Using a wound dressing protects the wound from contamination and prevents infection, as well as as speeds up the wound healing process. In this research, biocompatible polymer nanofibers containing natural materials and with high antimicrobial ability were designed and manufactured for wound covering. The results showed that the new dressing designed with nano technology, due to having nanometer pores, improve wound healing and also provides the moisture required by the wound during the treatment process. Also, the use of natural antimicrobial substances reduces the contamination of the wound and accelerates the wound healing process.

Key words: dressing, nano, wound, natural, medicine

1. Khayyam Student Research Center, two District Education, Kerman
2. Sharif High School, Kerman

Production of new bio-absorbents using waste natural materials and their application in improving plant growth

Batool Tahamipour[1], Hadis Afzali, Sara Fahiminejad[2]

Abstract

Iran is a dry and desert country that always faces the problem of water shortage, especially in the field of agriculture. Biological and food wastes are one of the major environmental problems that lead to pollution in the environment. Super absorbents are polymer networks that can absorb water up to 400 times their weight and can be used to store water in agricultural lands. These super absorbents can be made from different polymer materials. One of the ways to prepare super absorbents is to use polymers found in waste. In this research work, a new biological super absorbent has been designed and produced using natural waste to reduce water consumption and control agricultural land pollution. Also, the use of this structure in improving the growth of plants has been investigated. The results show that the prepared structure has nanometer pores. In addition, the effect of this structure on the growth of different plants shows that the use of this structure has had a good effect on the growth of different plants.

Key words: superabsorbent, biological, waste, plants, agriculture

1. Khayyam Student Research Center, two District Education, Kerman
2. Sama Girls' High School, second term, Kerman branch

Preparation of biological nano coatings based on natural waste to increase the shelf life of food ingredients and to investigate their antimicrobial effect

Batool Tahamipour[1*], Fatemeh Jafari[2], Niayesh Kadkhodaei[3]

Abstract

Food packaging plays an important role in protecting the material during the processes of storage, transportation and delivery to the customer. Innovation in food packaging industry improves quality, makes them biodegradable and creates antimicrobial properties in them. Today, the concerns related to the use of chemical preservatives and also unhealthy foods have caused the tendency to use compounds extracted from plants and animals as natural resources to preserve and preserve various food items. The use of natural materials can play an effective role in improving the quality of food sources due to having polyphenolic compounds. Today, nanotechnology has many applications in the food industry. A group of nanostructures that have been highly regarded in food packaging are nanofibrous composites. In this research project, a new composite nano fiber coating has been designed for preserving food and fruits. Also, the effectiveness of this coating against microbial agents in edibles has been investigated. The results showed that this coating has a good effect in preserving food and preventing the growth of microbial agents.

Keywords: nano coating, maintenance, waste, antimicrobial, biological

1. Khayyam Student Research Center, two District Education, Kerman
2. Sama Girls' High School, first term, Kerman branch
3. Sama Girls' High School, first term, Kerman branch

Removal of methylene blue by polyacrylamide-g-chitosan Fe_3O_4 nanocomposite: characterization and adsorption studies

Mohadese Babaei [1*] , Zahra Daneshfar [2*], Dariush Afzali [3]

Abstract

In this study, the magnetic adsorbent was applied for the removal of cationic methylene blue dye (MB) from aqueous solution. Fe_3O_4 nanoparticles were prepared by alkaline precipitation using ferric and ferrous chloride as pre-cursor and coated with polyacrylamide- graft-chitosan (PAM-g-CS). The phase formation and crystalline nature were confirmed by Fourier Transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), and vibrating sample magnetometer (VSM). The X-ray diffraction results showed that nanoparticles have well crystallized structure with average particle size of 10 nm. VSM analysis for Fe_3O_4 and PAM-g-CS/ Fe_3O_4 particles at room temperature revealed a super paramagnetic behavior with high saturation magnetization and no remnant magnetization. The FTIR spectrum confirmed the coating of PAM-g-CS on the surface of Fe_3O_4 nanoparticles. Adsorption of methyl blue (MB) onto adsorbent was investigated with respect to pH (3,7,9), adsorption time and initial MB concentration (20-120 mg/l). The adsorption isotherm at the optimum pH 7, were fitted by Langmuir and Freundlich isothermal models where the equilibrium adsorption data were well described by the Freundlich isotherm. Results highlight the potential of PAM-g-CS/ Fe_3O_4 application as an adsorbent for water contaminated by MB dye.

Keywords: Magnetic Composite nanoparticle; Methylene Blue; Acrylamide-g Chitosan Copolymer; Adsorption

1. Department of Nanotechnology, Gratuate University of Advanced Technology, Kerman,Iran
2. Department of Chemical and Polymer Engineering, Yazd University, Yazd, Iran
3. Department of Nanotechnology, Gratuate University of Advanced Technology, Kerman,Iran

Fabrication and characterization of semiconductor metal oxide nanofiber based chemical gas sensor

Nastaran Alinia Maryan, Fahimeh HooriAbadSaboor*, Aziz Babapoor

Abstract

Today, air pollution is one of the serious problems of society, which is increasing with the advancement of technology and industrialization. Most of these polluting gases are colorless and odorless, which humans inhale without knowing it. Since people's sense of perception of their surroundings is very limited, it is very important to use sensors that have the ability to detect quickly and very selectively. Among the types of gas sensors, chemical resistance sensors are the best choice for detecting gases in the air environment. Apart from the choice of materials, the morphology of nanostructures also affects the performance of gas sensing. Nanostructured materials, especially nanofibers, have significant importance in recent decades due to their potential applications in nanoengineering and nanotechnology. In particular, metal oxide nanofibers have great potential for the development of gas sensors. The current study is focused on the detection of harmful gases by chemical resistance gas sensors based on nanofibers synthesized by electrospinning method and also the reason for the superiority of nano structures in gas sensing.

Keywords: Gas sensing, metal oxide semiconductor, nanostructures, nanofibers, electrospinning

Electronic properties of two-dimensional material BC_2N with different structures

Pouria Rabiei Tussel[1], Shoaib Babaei Toski[2]

Abstract
In this article, the electronic properties of eight different structures of BC_2N have been investigated. In this work, the method of density function theory is used. Four of these eight structures have been reported in other works and four structures have been reported for the first time in this work. In the following, the band structure of these materials has been obtained and some structures have an energy gap and show semiconducting properties. While, the other four structures show a zero energy gap that has a Dirac point near the Fermi level. Conduction and capacitance band have been studied in the entire Brillouin zone. Finally, the density of states for these structures is studied and the amount of contribution of each orbital is discussed.

Keywords: BC_2N, band structure, energy gap, Dirac point, conduction and valence band, Brillouin, orbital

1. MSc student in electrical engineering (micro and nano electronic devices) Hamedan University of Technology, Hamedan, Iran
2. Assistant Professor of Electrical Engineering Department, Hamedan University of Technology, Hamedan, Iran

Effect of surfactant on alginate-based magnetic hydrogel properties

Reyahane Pourgohari, Parisa Hejazi *[1]

Abstract

The polymer network of nanocomposite hydrogels has improved rheological properties compared to conventional hydrogels. This property enables wide use in the field of drug delivery and separation of biological substances. Alginate biopolymer is one of the preferred biopolymers in environmental applications due to its non-toxic and biodegradable properties. In this research, the synthesis of alginate-based nanocomposite hydrogel by sol-gel method with the combination of magnetic iron nanoparticles suspension in the gel precursor with and without the presence of CTAB cationic surfactant and their behavioral properties including swelling behavior were investigated. The hydrogel was studied against different temperature, pH and ionic strength. By examining the characteristics of this hydrogel, it was found that modification of the hydrogel surface using nanoparticles or gel precursors changes the behavior of the hydrogel and the swelling rate changes in organic and aqueous environments based on different environmental conditions. This feature leads to the design of a smart hydrogel for different purposes.

Keywords: Nanocomposite hydrogel, hydrogel swelling behavior, iron oxide nanoparticles, cationic surfactant

1. Biotechnology Research Laboratory, School of Chemical, Petroleum and Gas Engineering, University of Science and Technology, Tehran, Iran

Fabrication and investigation of properties of chitosan-polyacrylic acid pH-sensitive nanoparticle

Fatemeh Fathali, Ali Taravati *, Majid Tafrihi

Abstract

Nanoparticles are promising carriers due to their ability to deliver molecules, and this capability is based on their swelling behavior. One of the critical elements of nanoparticle design that affects pharmacokinetics and cellular uptake is nanoparticle morphology. The aim of this study is to compare the swelling rate of chitosan-polyacrylic acid nanoparticle at different pH and show the morphology of this nanoparticle.

Chitosan-polyacrylic acid nanoparticles were synthesized. A certain amount of the nanoparticle was placed in three KCl-HCl buffers (pH=1.2), Acetate buffer (pH=5) and Tris-HCl buffer (pH=7.4), and their swelling was checked in certain time period. Also, the morphology of the nanoparticle was analyzed by SEM.

Chitosan-polyacrylic acid nanoparticle was synthesized by polymerization of acrylic acid in chitosan. Among the advantages of this system, it can be mentioned that the constituent polymers are hydrophilic, non-toxic and biodegradable. Also, the investigation of swelling showed a positive pH-sensitive behavior of chitosan-polyacrylic acid nanoparticle. The results indicate a remarkable difference in the swelling rate of chitosan-poly acrylic acid nanoparticle at pH=1.2 compared to pH=5 and pH=7.4; As a result, this nanoparticle can be an appropriate carrier for the delivery of drugs and other substances to the stomach cavity.

Keywords: Chitosan-polyacrylic acid, Nanoparticles, Swelling

Separation of functionalized graphene nanoparticles from aqueous medium by styrene atom transfer radical polymerization

Parian Biabani[1], Majid Safajou-Jahankhanemlou[2], Amir Heydari[3]

Abstract

One of the suitable ways to prepare well-structured polymers with predetermined molecular weight and low dispersion index is the atom transfer radical polymerization method. Most vinyl monomers are capable of polymerization through atom transfer radical polymerization. This process is based on a combination of an active and an inactive component that causes the growth of all chains at the same time and the polymer is the result of an increase in molecular weight. The atom transfer radical polymerization method is a popular member of the controlled polymerization family compared to other available methods. This method was first reported in 1995 by the research group of Savato and Matato, and today it is introduced as a popular member of the controlled polymerization family, which has been paid more attention than other methods due to its lower sensitivity to impurities and easy working conditions of temperature and pressure. The advantages of the atom transfer radical polymerization method are the availability of its components and materials in a commercial form, the ability to polymerize most monomers with various functional groups, mild polymerization conditions, and the ability to be used in various polymerization environments. Also, atom transfer radical polymerization is one of the important methods for styrene polymerization. The working method is that the starting materials for radical atom transfer polymerization have been selected and after optimizing the atom transfer polymerization process, styrene monomer, graphene and graphene oxide are dispersed in the aqueous phase and the amount of

1. Department of Chemical Engineering, Faculty of Engineering, University of Mohaghegh Ardabili, Ardabil 56199-11367, Iran
2. Department of Chemical Engineering, Faculty of Engineering, University of Mohaghegh Ardabili, Ardabil 56199-11367, Iran
3. Department of Chemical Engineering, Faculty of Engineering, University of Mohaghegh Ardabili, Ardabil 56199-11367, Iran

nanoparticles absorption on the surface of the polymer particles formed by FTIR, Raman, TGA and SEM analyzes have been investigated. In the next step, the method of functionalizing the surface of nanoparticles with polystyrene was used and the success of the surface was studied by FTIR and TGA analyses. Then functionalized nanoplates were used in simultaneous ATRP polymerization of styrene and the placement of absorbed nanoplates was studied using TEM and SEM microscopic analyses.

Keywords: polymerization, atom transfer radical polymerization, Controlled polymerization

Study on Properties of Nanocomposites Prepared by Unmodified/Modified Multi-walled Carbon Nanotubes and Conductive Thiophene-based Polymers Including P3HT, PBDT-DTNT, and PBDT-TIPS-DTNT-DT

Saleheh Abbaspoor*[1]

Abstract

Unmodified/modified multi-walled carbon nanotubes and various conductive thiophene-based polymers including poly(3-hexylthiophene) (P3HT), poly[benzodithiophene-bis(decyltetradecyl-thien) naphthothiadiazole] (PBDT-DTNT), and poly[bis(triiso-propylsilylethynyl) benzodithiophene-bis(decyltetradecyl-thien) naphthobisthiadiazole] (PBDT-TIPS-DTNT-DT) were utilized for fabricating hybrid nanocomposites. Nanocomposites properties and effect of thiophene-based polymer structure on final morphology were investigated by AFM and TEM analyses. P3HT chains resulted in face-on orientation on the unmodified MWCNTs. Because of interaction of thiophenic and benzoic rings in polymer chain structure, PBDT-DTNT and PBDT-TIPS-DTNT-DT chains caused to cover all surface of unmodified MWCNTs. Surface modification was performed by thiophenic poly(3-dodecyl thiophene) (PDDT) chains grafting on the surface of MWCNTs. P3HT chains in presence of modified MWCNTs exhibited a flat-on orientation. But, in case of PBDT-DTNT and PBDT-TIPS-DTNT-DT chains, presence of thiophenic chains on the surface of modified MWCNTs did not permit to orient huge polymer chains having thiophenic and benzenic rings. Results of this study is important in case of donor-acceptor nanocomposite construction applied in polymer solar cells.

Keywords: Surface modification, thiophene-based polymers, morphology, carbon nano tubes, donor-acceptor nanocomposites

1. Assistant Professor, Chemical Engineering Department, School of Engineering, Damghan University, Damghan, Iran

Suspension polymerization is a powerful method to create thermally expandable microcapsules

Mahsa Habibiyan garaveran[1], Majid Safajou jahankhanemlou[2*]

Abstract

Thermally expandable spherical particles (TEMs) with micron dimensions can be prepared from the polymerization of monomer around the liquid hydrocarbon core in aqueous medium. During the polymerization process, the polymer layer becomes harder and forms a solid shell. As the temperature increases, the vapor pressure of the liquid core increases and the polymer shell softens at the same time. The volume increase of about 100 times can be done by increasing the temperature of these particles up to about 190 °C. This process has had many applications in gas storage in recent decades. Polymerization methods are used to prepare microcapsules, and in this article, a review of the simultaneous suspension polymerization method for the production of TEMs has been done.

Keywords: microcapsule, expandable particles, core-shell structure, suspension polymerization

1. Master's student, Chemical Engineering, Mohaghegh Ardabili University, Ardabil, Iran
2.* Assistant Professor, Department of Chemical Engineering, Mohaghegh Ardabili University, Ardabil, Iran

Organic-metallic frameworks as nano adsorbents in order to increase hydrogen purity in biomass gasification process

Zahra Soltani[1], Fahima Houriabad Sabour[2]*

Abstract

In recent years, due to global climate changes and the energy crisis, the absorption and storage of carbon dioxide in the process of producing clean and sustainable fuels such as the production of hydrogen fuel in the process of biomass gasification has been intensively studied and investigated. Many methods for absorbing carbon dioxide in the hydrogen production process have been presented by researchers. The process of biomass gasification along with the absorption process can increase the production of hydrogen-rich gas through the absorption of carbon dioxide. In this article, first, hydrogen production in the process of biomass gasification and then carbon dioxide absorption with different methods have been discussed and investigated. The results of this study show that the development of new materials for the absorption and separation of carbon dioxide is very necessary. Organo-metallic frameworks are useful as an adsorbent for carbon dioxide absorption and hydrogen clean energy due to their unique chemical and structural properties including pore size, unsaturated or open metal sites, functional control, polar functional groups in the cavities. Therefore, it can be concluded that the integration of biomass gasification process and carbon dioxide absorption process using organic-metallic frameworks will be an effective way to produce hydrogen with high purity.

Keywords: nano adsorbent, organic-metallic frameworks, hydrogen, biomass gasification, carbon dioxide

1. Master's student in Chemical Engineering, Faculty of Engineering, Mohaghegh Ardabili University, Ardabil, Iran
2. Member of the Faculty of Chemical Engineering Department, Technical-Engineering Faculty, Mohaghegh Ardabili University, Ardabil, Iran

Study and molecular dynamics simulation of DNA transfer through graphene nanopores

Fariba Shafiei*, Samaneh Ghanbari-Kashan and Narges Nikoofard [1]

Abstract

The importance of DNA sequencing has increased dramatically in recent years because DNA sequencing is a key technology in many areas of biology that helps clarify various disease mechanisms and improve genetic diagnoses. A new generation of DNA sequencing that offers a new paradigm due to its vast potential for long reads and high throughput is nanopore DNA sequencing. In this method, the nucleotides inside the DNA molecule or the bases are identified through the nanopores under electric potential. Given the significant advances in protein nanopores sequencing technology, there is still great enthusiasm for alternative nanopores sequencing techniques, especially those based on solid-state nanopores. Because solid-state nanopores are more robust and enable integration on electronic chips, they are able to overcome the limitations of their biological counterparts. However, there are still several defects in the use of solid-state nanopores material, or graphene. One of these defects is caused by the specific hydrophobic interaction between DNA molecules and graphene atoms, which cause blocking of graphene nanopores. In the present study, the transfer of DNA strand with arbitrary sequence through graphene nanopore was investigated using molecular dynamic simulation. In order to solve the defect of hydrophobic interaction, a general and suitable method for making the surface hydrophilic should be developed so that it prevents the adsorption of DNA on graphene and single-stranded DNA can be well identified in graphene nanopores.

Keywords: DNA sequencing, Graphene nanopore, Molecular dynamics simulation, Hydrophilic.

1. Institute of Nanoscience and Nanotechnology, University of Kashan, Kashan, Iran.

Investigating the synthesis of graphene polymer nanocomposites using in-situ polymerization

Melika Salimi[1], Majid Safajou-Jahankhanmlou[*2]

Abstract

The unique properties of graphene polymer nanocomposites are related to the distribution of graphene particles (graphene and graphene oxide) in the polymer substrate. Along with various mechanical and chemical methods to increase dispersion, in situ polymerization as an upstream method has always been of interest to researchers. Pre-polymerization of graphene and graphene oxide in the presence of monomer has been able to improve its surface properties and provide the ability to disperse in the organic environment of polymerization. The presence of graphene increases electrical and thermal conductivity along with improving the strength of polymer nanocomposite. Various applications of graphene nanocomposites are in the field of energy storage, conductive rubber production, biological, medical and chemical sensors, drug delivery and tissue engineering.

Keywords: in situ polymerization, nanocomposite, graphene, graphene oxide, suspension polymerization

1. Master's student, Chemical Engineering, Mohagheg Ardabili University, Ardabil, Iran
2. *Assistant Professor, Department of Chemical Engineering, Technical and Engineering Faculty, Mohaghegh Ardabili University, Ardabil, Iran

Electrospinning of polyurethane graphene or graphene oxide nanocomposite for medical applications

Mohammad Farhamandlou[1], Majid Safajou-Jahankhanemlou[*2], Ali Nematollahzadeh[3]

Abstract

In this review article, the presence of graphene or graphene oxide in wound dressings with electrospinning of polyurethane fibers is discussed to improve their mechanical and biological properties. The effect of different concentrations of graphene oxide or graphene in fibers, which improves the mechanical and antibacterial properties of wound dressings, has been investigated. The mechanical, structural and biological properties of dressing fibers have been analyzed by scanning electron microscopy and fourier transform infrared spectroscopy. The results show that wound dressing in the presence of graphene oxide/polyurethane fibers can be a promising option for skin wound management. This study highlights the potential of graphene-based materials for biomedical applications, including wound management.

Keywords: electrospinning process, polyurethane, graphene oxide, graphene, wound dressing

1. Master's student, chemical engineering, Mohagheg Ardabili University, Ardabil, Iran.
2. *Assistant Professor, Department of Chemical Engineering, Mohaghegh Ardabili University, Ardabil, Iran.
3. Faculty of Technology and Engineering, Mohaghegh Ardabili University, Ardabil, Iran.

Green synthesis and Characterization of pyrochromite ($MgCr_2O_4$) nanostructures using aloe vera plant extract by sol-gel method

Maryam karami*, Maryam Shaterian[1]

Abstract

In this study, pyrochromite nanostructures were successfully synthesized via sol-gel method using aloe vera plant extract as chelating agent. Characterizations of the resulting nanostructures were carried out by Fourier transform infrared spectroscopy (FT-IR) and X-ray diffraction (XRD). The existence of a metal-oxide functional group is confirmed by FTIR spectra. Structural analysis of $MgCr_2O_4$ indicated a cubic framework in an XRD pattern, bearing an average crystallite size of 28 nm.

1. * Department of Chemistry, Faculty of science, University of Zanjan, 451561319 Zanjan, Iran.

Recent Advances in Metal-based Nanomaterials for Battery Applications

Ali Ghezi[1*], Roghayeh Maghsoudi[2], Kamran Keynejad[3], Hedayat Azizpour[1] Zahra Nasrollahi[4]

Abstract

Due to population and economic growth, the global energy demand has increased significantly. Various energy resources, such as bioenergy, wind, geothermal/solar energy, and other fuel technologies, as well as low-cost energy storage has been implemented to address the energy crisis. Rechargeable batteries have been considered stable electrochemical energy storage devices to store the intermittent electric output. This review examines the potential of nanotechnology in batteries, particularly metal/metalloid-based nanoparticles, because of their chemical properties and superior physical. The article presents recent advancements in metal/metalloid-based materials and highlights the scientific and socioeconomic benefits of using these materials over conventional graphitic anodes. The review also compares metal/metalloid nanoparticles for electrochemical applications, including metal-organic frameworks, metal oxides, and graphene/metal nanomaterials. Finally, the article addresses future challenges for developing possible batteries with metal/metalloid-based nanoparticles.

Keywords: LIBs (Lithum ion batteries), Metal/metalloid nanoparticles, Nanomaterials, Energy storage

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1. Fouman faculty of engineering, College of Engineering, University of Tehran, Fouman, Guilan, Iran
2. Department of Chemical Engineering, Faculty of Engineering, Shahid Chamran University of Ahvaz, Ahvaz, Iran
3. Fouman faculty of engineering, College of Engineering, University of Tehran, Fouman, Guilan, Iran
4. Fouman faculty of engineering, College of Engineering, University of Tehran, Fouman, Guilan, Iran

Synthesis and characterization of polymer hexagonal micro scale arrays using air moisture condensation phenomenon

Ali Ghaderi[1], Mohammad Jazirehpour[2*]

Abstract

Nowadays, the importance of photonic crystals as an approach for absorbing, transmitting, or propagating special radiation wavelengths is well understood. In this regard, arranging regular and repeatable arrays on active photonic surfaces is considered an approach for developing this kind of crystal. In this research, the production of microscale arrays with a hexagonal arrangement that have been inspired by the natural phenomenon of dew formation (droplet condensation on a cold surface) has been studied. In this regard, some polymers, such as polystyrene and polymethylmethacrylate, dissolved in organic solvent, have been used as templates for air moisture droplets. Also, the influence of some parameters, such as relative humidity, air flow's condition, polymer concentration in the consuming solvent, and type of substrate, has been studied, and an array of micropores with a hexagonal shape and various optical features has been obtained. When a 2.5 wt% polystyrene solution was used, the pores were measured at an average of 5 micrometers by an optical microscope. Also, it has been determined that polymer solution evaporation rate is the key factor in regular structure formation and that changing the concentration of the polymer solution causes changes in the pore size and the distance between them. The synthesis of these structures by this method compared to other methods such as lithography is more economical and has the ability to mass produce.

1. PHD student, Nanophysics, Malek Ashtar University of Technology, Iran
2. Assistant professor, Department of Electroceram and Electrical Engineering, Malek Ashtar University of Technology, Iran

Preparation and characterization of the Sol-gel derived SiC nanocrystals

Z. Zalnezhad[1], H. Haratizadeh,*[1], M. Sasani Ghamsari[2]

Abstract

Silicon carbide is one of the most important semiconductors that has favorable physical, chemical and optical properties and is widely used in various industries such as electronics, chemicals and quantum computers. In the reports, various methods such as hydrothermal, carbothermal reduction and sol-gel are used to prepare silicon carbide nanoparticles. Among these methods, sol-gel has received much attention due to its high efficiency, controllability of the process, biocompatibility, availability of consumables and the formation of nanoparticles. In this article, sol-gel method and carbothermal reduction using tetraethylorthosilicate ($(C_2H_5)_4SiO_4$) and sucrose ($C_{11}H_{22}O_{11}$) precursors were used as silicon and carbon sources, respectively, to prepare silicon carbide nanopowder. Then, the silica/sucrose composite was placed in a vacuum furnace at a temperature of 1450°C for 3 hours for carbothermal reduction in an argon atmosphere with a pressure of ten millitorr. The structural properties of silicon carbide nanopowder prepared using X-ray diffraction and its optical properties were investigated using FTIR, PL analyses. The experimental results show that silicon carbide nanoparticles have a better crystalline state with an approximate grain size of 14 nm.

1. Basic Science School, Shahrood University, 1659639884, Tehran, Iran.
2. Photonics and Quantum Technologies Research School, NSTRI, 11155-3436, Tehran, Iran.

Fabrication and assessment of vacuum insulation panels with nanoporous aerogel blanket

Hassan Bargazin, Taher Yousefi Amiri, Narges Rahimi, Shadi Rajabi

Abstract

One of the ways to prevent global warming is to use various types of insulation in industries and buildings. Modern insulations based on nano technology, such as silica airgel blanket, are a suitable and advanced solution to control energy consumption. Vacuum insulation panels also have unique properties such as low thermal conductivity coefficient and much less thickness than traditional insulation. In this article, a comprehensive review on the characteristics, structure and innovations of vacuum panel insulation is discussed and vacuum panels with nanoporous airgel blanket core are investigated and manufactured. The integration of nanoporous airgel blanket insulation as the core of the insulation panel under vacuum can cause synergy in thermal and sound insulation properties and lead to the achievement of a super insulation with application in industries and construction. Using the amount of different vacuums, creating a stable vacuum over time, comparing different cores under vacuum, different panel thicknesses under vacuum, etc.

Effect of milling time on the microstructural evolution and mechanical properties of Al− 5%wt ZrB_2 nanocomposite consolidated by equal channel angular pressing

Hossein Jafari [1], Mehdi Montazeri-Pour [2], Masoud Rajabi[3]

Abstract

The effect of milling time on mechanical properties and microstructure of Al-5%wt ZrB_2 nanocomposite powder was investigated. Al-5%wtZrB_2 nanocomposite powder was milled at different times and then consolidated and turned into a bulk material by equal channel angular pressing (ECAP). The size of the particles obtained from the scanning electron microscope images showed that increasing the milling time up to 18 hours leads to a decrease in the size of the particles, and after this time, their size becomes larger. Using the XRD technique and calculating the size of the crystallites, their size reduction rate decreased after 12 hours of milling and reached its lowest value in 18 hours. After that, increasing the milling time has led to an increase in the size of the crystallites and a decrease in the lattice strain. In the bulk samples produced by the ECAP method, the grain size reduction continued until 18 hours of milling, so that the smallest grain size and the most homogeneous microstructure were related to the samples that were milled for 18 hours. The hardness and strength of the samples increased up to 18 hours of milling; however after 12 hours, the rate of increase decreased. Reducing the size of grains, increasing the density of dislocations and solid dissolution have been factors effective for the high rate of hardness increase. By the activation of the dynamic recovery mechanism after 18 hours, the grain size increased while hardness and strength decreased. As a result, the best mechanical properties and refinement of grains in samples consolidated by ECAP were related to samples whose powder was milled for 18 hours.

Keywords: Milling, Equal channel angular pressing, Mechanical properties, Grain refinement, Al-5%ZrB_2 Nanocomposite

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1. Ph.D. Student, Department of Metallurgy and Materials Science, Imam Khomeini International University, Qazvin, Iran
2. Assistant Professor, Department of Chemical and Materials Engineering, Buein Zahra Technical University, Buein Zahra, Qazvin, Iran
3. Associate Professor, Department of Metallurgy and Materials Science, Imam Khomeini International University, Qazvin, Iran

Biodegradation of some of Mycotoxins by Using some of Medicinal Plants Extracts and Bio-control Fungi

Nihad H. Mutlag[1], Hajer S.Radhi[2]

Abstract

This study was conducted in the laboratories of the department of Ecology and Pollution / college of science/ university of Kufa during the period from 15/10/2022 to 15/3/2023 .

This study aimed to isolate and identify fungal species belonging to the genus *Aspergillus flavus* and *Fusarium oxysporium* by selected native plant seeds from iraqian markets specially maize (*Zea mays*)and Tomato (*Solanum lycopersicum*) ,then extraction aflatoxins and fumonisin by using modern techniques such as ammonia solution(10%) High – Performance liquid chromatography technique (HPLC) and polymerase chain reaction technique (P.C.R.) ,it also aimed evaluate the effectiveness of local medicinal plants, *Thymus vulgaris* and *Cyperus rotundus*. extracts and biological control Fungi *Trichoderma harzianum* and *Pleurotus ostreatus*in filtrates in the inhibition of growth for some pathogenic fungi (*Aspergillus flavus* and *Fusarium oxysporium*) ,also evaluate the ability of these plant extracts and fungal filtrates in biodegradation of aflatoxins and fumonisin after dosage to albino rats producing fungi in addition to evaluate the ability of this bacteria in the degradation of the aflatoxin B1 toxin.

1. Department of Ecology , Faculty of Science, University of Kufa, Najaf, Iraq
2. Department of Ecology , Faculty of Science, University of Kufa, Najaf, Iraq

Applications of Nanotechnology for Sustainable Agriculture and Rural Development

Seyed Mohammad Javad Sobhani [1], Sharif Joorabian Shooshtari[2]

Abstract

In recent years, the use of nanotechnology in various fields of science and industry has grown significantly. Most of them have focused on issues related to agriculture, water and soil management, ecosystem management and food processing. Global experiences in these sectors have shown the significant impact of this technology on the preservation and sustainable development of agricultural ecosystems along with improving the efficiency of inputs in order to achieve the goals of sustainable agriculture and food security. On the other hand, as the main source of agricultural production, nearly half of the world's population lives in rural areas, which face major challenges such as lack of clean water, food, good health, energy, sustainable economy and environment. Many important challenges of rural society can be answered by providing solutions based on nanotechnology and Nano-scale materials, especially in underdeveloped and developing countries. In this article, a review with a systematic study of new sources of some of the most basic applications of nanotechnology in agriculture and food, clean water, energy, environment, human health and other consumer products is presented. This survey has categorized the range of nanotechnology applications in the rural and agricultural sector into three economic, social and environmental areas and has presented a comprehensive model from the point of view of the sustainability of new technologies to the society.

Keywords: Nanotechnology, Agricultural development, Rural development, Sustainable agriculture.

1. Assistant Professor, Department of Agricultural Extension and Education, Faculty of Agriculture Engineering and Rural Development, Agricultural Sciences and Natural Resources University of Khuzestan, Mollasani, Iran.
(Corresponding author: mj.sobhani@asnrukh.ac.ir)
2. Assistant Professor, Department of Nature Engineering, Agricultural Sciences and Natural Resources University of Khuzestan, Mollasani, Iran.

Nanotechnology Role Development for COVID-19 Pandemic Management

Mahdi Ataeian Tavana[1]

Abstract

The global outbreak of coronavirus disease has sent an ominous message to the field of innovative and advanced technology research and development (COVID-19). To accomplish this, convectional technology and recent discoveries can be combined, or new research directions can be opened up using nanotechnology. Nanotechnology can be used to prevent, diagnose, and treat SARS-CoV-2 infection. As the pandemic spreads, a thorough examination of nanomaterials' role in pandemic response is highly desirable. According to this comprehensive review article, nanotechnology can be used to prevent, diagnose, and treat COVID-19. This research will be extremely useful during the COVID-19 outbreak in terms of developing rules for designing nanostructure materials to combat the outbreak.

Keywords: Nanotechnology, COVID-19, Medicine, Pandemic

1. Masters Student Chemical engeneering, Imam hossein university

Characterization of Metal Oxide-Based Gas Nanosensors and Microsensors Fabricated via Local Anodic Oxidation Using Atomic Force Microscopy

Mahdi Ataeian Tavana[1]

Abstract

This work reports on nanoscale and microscale metal oxide gas sensors, consisting of metal-semiconductor-metal barriers designed via scanning probe microscopy. Two distinct metal oxides, molybdenum and titanium oxides, were tested at different temperatures using CO2 and H2 as test gases. Sensitivities down to ppm levels are demonstrated, and the influence of dry and humid working atmospheres on these metal oxide conductivities was studied. Furthermore, the activation energy was evaluated and analyzed within working sensor temperature range. Finally, full morphological, chemical, and structural analyses of the oxides composites are provided allowing their identification as MoO3 and TiO2-x.

Keywords: Nano sensors, Microsenors, Nanotechnology, Force microscopy

1. Masters Student Chemical Engeneering, Imam hossein University

Synthesis and characterization of antimicrobial nanocomposite: "chitosan/eucalyptus essential oil/zinc oxide nanoparticle" for use in food packaging industries

Niloofar alian[1], Raheleh Safaeijana[2*], sahar honarmand jahromi[3]

Abstract

Nowadays, the use of antimicrobial materials in the packaging of food products and the creation of active packaging for long-term preservation of food materials and also preventing the spread of diseases caused by corruption have developed a lot. In this research, after synthesizing zinc oxide nanoparticles by the green method, these nanoparticles have been used to prepare a chitosan/zinc oxide nanoparticle/eucalyptus essential oil nanocomposite film for use in packaging protein products.
In this study, zinc oxide nanoparticles were biosynthesized by eucalyptus extract. Characterization of these nanoparticles was done by electron microscope tests, X-ray diffraction, and UV visibe spectroscopy. Then 3 groups of films including chitosan film, chitosan/zinc oxide nanoparticle film and chitosan/zinc oxide nanoparticle/eucalyptus essential oil nanocomposite film were prepared. To study the physical and chemical properties of these films, electron microscopy, FTIR spectroscopy, thermal gravity and tensile tests were performed. In order to evaluate the antimicrobial properties of the prepared nanocomposite films, disk diffusion method was used on Staphylococcus aureus, Pseudomonas aeruginosa, Enterobacter aerogenes and Escherichia coli bacteria.
Electron microscope images showed nanoparticles with a rod morphology and a minimum size of 43 nm. XRD spectrum shows the diffraction **peaks** at 2θ which was consistent with standard card no. JCPDS 36-1451 related to nanocrystal of zinc. Electron microscope images of the prepared samples showed that roughness in the film was

1. Department of Microbiology, Varamin Pishva Branch, Islamic Azad University, Varamin, Iran
2. Department of Biochemistry and Biophysics, Varamin Pishva Branch, Islamic Azad University, Varamin, Iran
3. Department of Microbiology, Varamin Pishva Branch, Islamic Azad University, Varamin, Iran

created by adding zinc oxide nanoparticles to the formulation of the films. In the chitosan/zinc oxide nanoparticle/essential oil film, the height and unevenness have increased due to the addition of essential oil. In the FT-IR spectrum for the chitosan/nanoparticle film, the presence of a peak at 520.22 cm^{-1} indicates the Zn-O band in the structure of zinc oxide nanoparticles, and for the chitosan/zinc oxide nanoparticle/essential oil film, the intensity of the clear peak decreases in the regions of 1000-1500 and also 2000 -3000 related to OH vibration and stretching vibration of CH2 and C=O indicates the creation of the final nanocomposite. TGA analysis showed that the increase of nanoparticles increased the thermal stability of the chitosan film. There was no significant difference between the TGA diagram of the chitosan/nanoparticle film and this diagram for the chitosan/nanoparticle/essential oil nanocomposite. Because it plays the main role for the thermal stability of this nanoparticle film and adding plant extract has no effect on the stability of the resulting nanocomposite against increasing temperature. The stress-strain diagram obtained from the tensile test showed that the presence of nanoparticles in the film decreased the flexibility of the film and increased the dryness, which, of course, was regained by adding the essential oil. Antibacterial properties of nanocomposites in different groups showed no growth of bacteria by measuring halo diameter, chitosan film alone has no antibacterial effect on any of bacteria. By adding zinc oxide nanoparticles and then eucalyptus antibacterial essential oil, this property increased so that the diameter of the non-growth halo in the chitosan/zinc oxide nanoparticle film compared to the diameter of this halo in the chitosan/nanoparticle/essential oil nanocomposite film for Staphylococcus aureus bacteria increased from 30 to 37 mm, in Escherichia coli bacteria from 25 to 30 mm, in Pseudomonas aeruginosa bacteria from 29 to 32 mm and in Enterobacter aerogenes bacteria from 25 to 28 mm.

Studies have shown that the antimicrobial properties of ZnO nanoparticles are mainly due to the release of Zn^{2+} ions, which strongly bind to the negatively charged bacterial cell wall and cause membrane damage. Also, another mechanism is the production of reactive oxygen species (ROS), which leads to oxidative stress to the cell and interaction with proteins, DNA, enzymes and lipids, which inhibits cell growth.

The overall results of this study showed that the resulting composite film can be used as a new antimicrobial biodegradable nanocomposite film in the food packaging industry.

Keywords: Zinc oxide nanoparticle, Chitosan, Green Synthesis, Nanocomposite, Eucalyptus essential oil, Food packaging

Shape Memory Polymers and Their Nanocomposites in Biomedical Engineering

Mohammad Hossein Latifi, Zahra Mohammadi*[1]

Abstract

Shape memory polymers (SMPs) and their nanocomposites as a significant type of smart materials have attracted the attention of many researchers in recent decades due to their promising applications in fields such as biomedicine, aerospace, smart textiles, and robotics. SMPs are capable of reversible deformation under various external stimuli like heat, electric/magnetic fields, pH, etc. This capability, along with the good biocompatibility of polymers and the biodegradability of some polymers has gained great potential for use in many biomedical applications such as tissue engineering scaffolds, drug-eluting stents, self-tightening sutures, and drug delivery systems. Also, the shape-memory property of SMPs allows medical devices to be folded into minimal volume, which makes them easily implanted in the body and recover their original shape. A brief review of the classification, architecture, mechanism of action, and design considerations of these SMPs is presented in this paper, followed by a discussion of recent studies on their use in biomedical applications.

Keywords: Shape memory polymers, Smart polymer nanocomposites, Biomedical applications, Shape-memory property

1. Bioceramic and Implant Laboratory, Faculty of New Sciences and Technologies, University of Tehran, Tehran, Iran

study of some electronic and spectral properties of (PMMA- $KMnO_4$) by density functional theory

Hussein Neama Najeeb, Wasan Mnati Mohammed, AsmaaM.Alshibly[1]

Abstract

In this research, using the Stuttgart Dresden Triple Zeta (SDD) as the basis function and the Gaussian View software, the effect of addition potassium permanganate dye $KMnO_4$ to the poly methyl methacrylate (PMMA) were investigated. We investigated the electronic and spectral characteristics. The HOMO and LUMO gaps were studied as part of the electronic characteristics., The energies in the ground states of the pure and doped dye were calculated, together with the energy gap, electronic affinity, and ionic potential. Concerning the spectral properties, it involved the analysis of electronic transitions and the ratios of the transitions that occurred in the energy levels by resolving the time-dependent Schrödinger equation., as well as determining the types of bonds and their positions by analyzing the infrared spectrum.

Keywords: PMMA, $KMnO_4$,DFT

1. University of Babylon College of Science for women- Physics Department, Iraq

Electrochemical polymerization methylene blue over glassy carbon electrode with zinc nanoparticles as sensor

Neam Abd-Alazize, Alaa Mohamadtayeb Al-Layla[1]

Abstract

The purpose of this research was to identify the optimal conditions for altering glassy carbon electrodes by electro-polymerizing methylene blue in a variety of buffer solutions (acetate buffer, phosphate buffer, Britton Robinson buffer) across a wide pH range. Experiments have shown that methylene blue can be electro-polymerized on a glassy carbon electrode under the right conditions (GCE). The electrode was modified by adding 5 µl of zinc nanoparticles to its surface; once the material dries on the electrode, electro-polymerization of the methylene blue monomer is carried out in a phosphate buffer solution (PBS) at (pH 8) with a concentration of 0.1 M. Twenty different cycles of precipitation were used in conjunction with cyclic voltammetry.. Additionally, the electrode's effective surface area was calculated using the Randells Sevcik for the potassium ferricyanide redox process using (the CV) technique, and it was found that the electrode's surface area increased by (2.5) times compared to the bare GCE, due to the active surface area, suggesting that the electrode could be used as a practical sensor

1. College of Science, University of Mosul, Department of Chemistry, Iraq

Evaluation the Antagonistic ability of Biocontrol Fungi against some of Fungi Isolated from Wastewater – AlBrakia Plant.

Nihad H. Mutlag[1] , Muthik A.Guda[2], Mohamad S. Jomaa[3]

Abstract

This study was conducted to evaluate the role of isolates of the fungus *Trichoderma. harzianum* and *Pleurotus ostreatus* in the antagonistic activity of 8 fungi isolated and diagnostic from from the Al-Barakia wastewater treatment plant on potato dextrose(PDA) agar and potato dextrose broth(PDB) media,

The diagnosed 8 isolates by polymerase chain reaction (PCR) technique. Where these results show the prevalence of fungi Acrimnium sp ,Alternaria.alternatie , Aspergillus .terrus , Aspergillus.flavus , Aspergillus.oryza , Aspergillus.caespitosis , Aspergillus.tubingesis , Aspergillus.niger .

This study showed that *T. harzianum* and *P. ostreatus* have a high antagonistic ability against filamentous and pathogenic fungi through double culture on petri dish ,PDA media that gave a significant differences of inhibition zone for biocontrol fungi against pathogenic fungi that isolated and diagnosed from waste water that reach (1,2)degrees of Bell scale which consist of 5 degrees ,also the results appears a significant weights of fungal mass after incubation of biocontrol fungi and pathogenic fungi for 21 days ,that gave ,also *T. harzianum* and *P. ostreatus* isolates have a high antagonistic ability against filamentous and pathogenic fungi through double culture on on PDB media that gave asignificant differences in the weight of biomass that calculated after 21 days of incubation which gave the following weights (3.99,4.12,4.23,4.55,4.67, 4.77,4.85,4.98)gm for *T. harzianum* with 8 isolates respectively ,while with *P. ostreatus* gave biomass weights reach (4.54,4.69,4.87,4.88,4.96,5.12,5.23,5.43)gm respectively in compare with control that gave (3.22,4.10)gm for *T. harzianum* and *P. ostreatus* respectively.

Key words: Wastewater, Antagonism, Trichoderma harzianum , Aspergillus spp, Pleurotus ostreatus.

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1. University of KufaFaculty of ScienceDepartment of Ecology and pollution
2. University of KufaFaculty of ScienceDepartment of Ecology and pollution
3. University of KufaFaculty of ScienceDepartment of Ecology and pollution

The Antifungal Effects of some Biocontrol Fungi Filtrates and Medicinal Plant Extracts on *Candida dubliniensis* Yeast

Nihad Habeeb Mutlag[1] , Fatima Basil Hameed[2]

Abstract

The study was conducted in the laboratories of the College of Science, Department of Environment and Pollution at the University of Kufa. This study aimed to demonstrate and evaluate the effectiveness of extracts of a group of local medicinal plants, *Thymus vulgaris* and *Cyperus rotundus*. Fungi were also used in biological control: *Trichoderma harzianum* and Pleurotus ostreatus against *Candida dubliniensis* yeasts. This current studied using the green method, to evaluate the effectiveness of these plant extracts and fungal filtrates in inhibiting the pathogenic yeast growth. The studied yeasts showed their sensitivity against plant extracts and fungal filtrate. As the fungus *P.osteratus* was more effective than the fungus *T.harzianum*, filtrates and the aqueous extract were the best filtrayes and extracts in inhibiting the yeast.

The Candida dubliniensis isolates were identified by using conventional techniques such as microscopic identification, CHROMagar culture and VITEK2-compact system. After confirming that the isolates were indeed *Candida dubliniensis*, the isolates were subjected to various treatments with green techniques to investigate the antifungal activity on Mueller Hinton agar by using the well diffusion method.

The means of inhibition zone diameter for all isolates of using *P.ostreatus* filtrates was (4,3) mm as a diameter ,while was (2.4) mm for addition of *T.harzianum* filtrates in the well , also the efficacy of using *Cyperus rotunds* and Thymus vulgaris leaves axstract in treatment of the *Candida dubliniensis* appear that the inhibition zone were (3.2,3.6)mm respectively ,so all the above treatments certificate significant differences on inhibition zone in compare with control that used distill water in the wells.

Key words: Wastewater, Antagonism, Trichoderma harzianum , Aspergillus spp, Pleurotus ostreatus.

1. University of KufaFaculty of ScienceDepartment of Ecology and pollution
2. University of KufaFaculty of ScienceDepartment of Ecology and pollution

The Possibilities Of Utilization Nanomaterials In The Facades Of Contemporary Buildings

Maysaa Muwafaq Younus

Abstract

The emergence of modern materials in recent years has contributed to the development of various scientific fields, including engineering fields, as the emergence of nanomaterials and their use in the field of constructing modern buildings has led to the production of buildings that are more developed and adapted to the environment, and to create more modern and creative architectural forms and formations, which helped the architect a lot in The field of design and construction, so the research aims to discover and determine the possibilities of employing nanomaterials in the facades of contemporary buildings and the impact of this employment on the process of designing the facades of those buildings, by building a knowledge framework that includes defining nanomaterials and their relationship to construction on the one hand, and nanomaterials and their relationship to architecture on the other hand, which Previous studies dealt with it in their theses, to determine the most important nanomaterials involved in the construction process, their capabilities and characteristics that the architectural designer can employ in the design and formation of its facades. In the formation of building facades by investing the properties of these materials.

Keywords: nanotechnology - nanomaterials - construction - contemporary buildings - building facades

Predictability of circulatory Cathelicidin LL37 levels for pediatric non-COVID-19 community-acquired pneumonia. A case-control study

Hayder Abdul-Amir M. Al-Hindy[1*], Al-Asadi Ekhlas [2], Ban Mahmood Shaker Al-Joda [3], Mazin J. Mousa [4], Amir S. Al-Mumin [5]

Abstract

Background: The third greatest reason for death globally and one of the most prevalent infectious diseases is community-acquired pneumonia (CAP). The innate immune response is essential for containing the initial infection and inhibiting the development of serious illness. A crucial element of this response is cathelicidin, which functions as a powerful antimicrobial peptide that can both directly kill microorganisms and modify the immune system's response to infection.

The study's primary objective is to inspect the relationship between CaLL37 and the severity of CAP in children.

Methodology: The 285 participants in this case-control trial, whose ages ranged from 1 to 18 months, were made up of 120 CAP patients and 165 controls. Cathelicidin levels were calculated for both CAP and the control subjects and compared, also the pneumonia-causing agent was determined. Those suspected of having COVID-19 CAP were not included.

Results: The participants' mean age was 9.7 (range of 1 to 18) months. In 46.2%, 35%, and 18.8% of cases of CAP; bacterial, viral, and mixed causative agents, respectively, were detected. Among the individuals, only 6.8% received mixed feeding, compared to 42.1% who used artificial feeding and 51.1% who exclusively breastfed. The mean total serum contained 8.6 ±6.7 ng\ml of CaLL37. CaLL37

1. Assis. Prof., Medical Physiology, Department of Pharmacology and Toxicology, College of Pharmacy, University of Babylon, Babylon, Iraq.
2. Dept. of Physiology, College of Medicine, University of Babylon, Babylon, Iraq.
3. Dept. of Chemistry and Biochemistry, College of Medicine, University of Babylon, Babylon, Iraq
4. Assis. Prof., Pathol., College of Pharmacy, University of Babylon, Babylon, Iraq
5. Hammurabi College of Medicine, University of Babylon, Iraq
*Corresponding author:
Orcid: 0000-0001-6232-8501, Medical Physiologist, Pediatrician, Babylon, P-51001, Iraq.

serum levels were comparable between the two study groups ($p>0.05$). The levels of CaLL37 were comparable ($p>0.05$) among patients with CAP when compared according to the causative agents, while plasma CaLL37 levels were higher among babies on artificial feeding (p-0.001). According to the ROC assays, CaLL37 plasma levels could not distinguish bacterial from viral pneumonia or those with pneumonia from healthy participants. Nevertheless, the CaLL37 can distinguish significantly between bottle-fed infants and those who are breast-fed (p-0.001, AUC=0.748, sensitivity=0.673, specificity=0.637, and 95%CI of o.675 - 0.820).

Conclusion: Cathelicidin has a weak ability to distinguish between CAP patients and healthy controls, as well as between different CAP causes. The study did show that CaLL37 can distinguish between infants who are breastfed and those who are artificially fed**.**

Keywords: Cathelicidin, LL37 community-acquired, C-reactive protein, pneumonia, pediatric.

Characteristics and clinical outcome of Femoral Artery Injuries

Abbas Jaafar Khaleel Al-Anbari *1, Noor Abbas Hummadi Fayadh 2

Abstract

Background: A leading cause of morbidity and mortality worldwide, and one of the most challenging and interesting problems in the surgical sector is arterial injuries. Femoral vessel injuries are the second most prevalent peripheral vascular injury after brachial artery injuries. To raise awareness and teach the medical personnel, this paper evaluates a single center's experience with femoral artery injuries. It also identifies the most common causes and complications of femoral artery injuries.

Material and method: a retrospective study was directed at the Al-Imamain Al-Kadhymain Hospital in Baghdad. The medical records of every patient admitted to the hospital during the previous two years and identified as having femoral artery injury were reviewed and analyzed. The study sample consisted of the records of 110 patients. The following data were gathered from these records: age, sex, occupation, residency, side of injury, cause of injury, clinical presentation, concomitant injuries, surgical intervention, and complications.

Results: Out of 110 individuals who enrolled in the trial, 78.2% of them were men. The patients were 34.1 years old on average. Urban patients made up 76.4% of the population. Penetrating wounds make up nearly fifty percent of all injuries. Hard signs were present in almost all of them. The mortality rate was low in the current analyses (2.7%).

Conclusion

Blast penetrating injuries were the most frequent cause of femoral artery injury. The amputation that followed from the extreme stress brought on by blast injuries was the most frequent complication of femoral artery injury.

Keywords: femoral artery, traumatic injuries, arterial injuries, repair.

1. Cardiovascular and Thoracic Surgery, Department of Surgery, College of Medicine, Al-Nahrain University, Iraq.
2. Diagnostic Radiologist, Department of Surgery, College of Medicine, Al-Nahrain University, Baghdad, Iraq. noorabbashummadi@nahrainuniv.edu.iq. Orcid: 0000-0003-3739-937X.
*Corresponding author
Consultant cardiovascular and Thoracic Surgery,
Orcid: 0000-0003-6048

Controlling the overlapping of laser pulses

Alaa Alasadi*[1] and Ghaiath A. Fadhil[2]

Abstract

An overlap and separation between the laser pulses was sufficiently controlled. The 800-picosecond pulse width laser system that have a repetition rate of 40 KHz have been engaged to implement this path. The system with 532 nm wavelength was focused with a 0.75 NA lens to a 1.83µm diameter spot. Two parameters were used to separate/overlap on sample using the pulses from laser system: the pulse repetition rate and the sample scanning speed. An electric current was supplied to the laser diode driver (LDD) to control the repetition rate of pulsed laser. The second parameter was implemented to control the train of pulses and the speed of scanning stage under computer-control. The distance or overlap between the pulses have been successfully controlled for an arrange from separate the pulses with distance) all to get 90% overlap between pulses. The aim of this method was to get a single pulse from high repetition rate pulsed laser and to scale down the damage of material that result from applied multi pulses. This method was studied and implemented to make the price more reasonable and simpler to use comparing it with using the complex and expensive optics equipment.

Key words: Overlap/Distance, Repetition rate, Scanning speed.

1. Department of Materials Science and Engineering, University of Sheffield, Sheffield, S1 3JD, United Kingdom.
Karbala Technical Institute, Al-Furat Al-Awsat Technical University, Karbala, Iraq. ORCID:0000-0002-5171-5845
2. Dept. of Medical Physics, College of Science, Al-Karkh university of science, Baghdad, Iraq. ORCID:0000-0002-2075-2328

Investigating the performance of Ni-Mn LDH/CNT/rGO nanocomposite as electrode material in supercapacitor

Pouria Abdollahi [1], Seyed Reza Hosseini Zavvarmahalleh*[2], Shahram Ghasemi-mir [3]

Abstract

The nanocomposite of Ni-Mn LDH on reduced graphene oxide/ MW-carbon nanotubes was prepared by using an easy synthetic method for the in situ growth of LDH crystals on a skeleton of CNT and rGO substrate. The structure of the synthetic nanocomposite was investigated by using instrumental methods such as FT-IR, XRD and Raman. We also investigated its electrochemical quantities by using Cyclic Voltammetry and Galvanostatic charge-discharge methods. Due to its unique structure, high conjugation length, specific surface area and high electrical conductivity, the synthetic nanocomposite can facilitate the electron transfer process and provide a favorable electrochemical performance. The synthetic electrode has the highest specific capacity at the scan rate of 5 mV/s and can maintain more than 93.5% of its specific capacity in 2000 cycles. The results obtained from the investigation of electrochemical quantities show that the synthetic electrode material can show a significant potential for use in energy storage devices.

Key words: Supercapacitor, Double Layer Hydroxide, Carbon Nanotubes, Reduced Graphene Oxide

1. University of Mazandaran, Faculty of Chemistry
2. University of Mazandaran, Faculty of Chemistry*
3. University of Mazandaran, Faculty of Chemistry

Prospects and Challenges for Nanobiotechnology in agricultural disciplines

Mohammad Golbashy[1]

Abstract

Nanotechnology, along with biotechnology, plays an important role in the advancement of agriculture. Nanobiotechnology for plants is currently an emerging field in agricultural research. The ability of nanotechnology to detect and control plant pathogens has proven beneficial to the agricultural industry and has led to an increase in livestock production. NPs, which are also very potent fertilizers for agricultural productivity, can be used to control pesticides and plant diseases. They have been shown to improve plant performance under biotic stress (e.g., pathogens and pests) and abiotic stress (e.g., salinity, drought, and temperature). Nanomaterials have a greater surface area than the same amount of bulk materials (a higher surface-to-volume ratio and likely more reaction sites) and may be less toxic to plants than commercial products.

Keywords: Nanomaterials, fertilizers, Nanobiotechnology, surface area

1. Assistant Professor, Department of Crop Production and Genetics, Faculty of Agriculture, Agricultural Sciences and Natural Resources, University of Khuzestan, Iran. Email: mgolbashy@asnrukh.ac.ir

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Key words: Supercapacitor, Double Layer Hydroxide, Carbon Nanotubes, Reduced Graphene Oxide

1. University of Mazandaran, Faculty of Chemistry
2. University of Mazandaran, Faculty of Chemistry*
3. University of Mazandaran, Faculty of Chemistry

Investigating the effect of carbon nanotubes on the failure mechanisms of composite multilayer

S. Esmail Fekari[1], Saba Safiri[2], Zeinab Roshani.B[3], S.Mohammad Reza Akrami[4], Jafar Agazadeh[5]

Abstract

Carbon nanotubes provide new mechanical properties. With the increasing use of carbon nanotubes in different structures, it has led to the continuation of activities for the development of dispersion and functional methods. In order to use carbon nanotubes as an effective reinforcement in polymer nanocomposites, dispersion and surface adhesion between carbon nanotubes and polymer matrix are presented. This article shows the progress of recent research on multi-layer composite structures consisting of different building materials. The use of multilayer composite systems has been developed in many applications. Impact density, including static compression and high strain rate properties of multi-layer carbon composites with different contents along the out-of-plane and inplane directions. It was examined using a mechanical tester. Compressive stress versus strain curves of woven composites with different CNT content obtained for static compression are compared and new results are obtained.

Keyword: Nano graphene, nanocomposite, under static loading

1. Department of Electrical Engineering, Islamic Azad University, Tabriz Branch, Tabriz, Iran
Department of Biomedical Engineering, Islamic Azad University, Tabriz Branch, Tabriz, Iran
2. Department of Electrical Engineering, Islamic Azad University, Tabriz Branch, Tabriz, Iran
Department of Biomedical Engineering, Islamic Azad University, Tabriz Branch, Tabriz, Iran
3. Department of Electrical Engineering, Islamic Azad University, Tabriz Branch, Tabriz, Iran
Department of Biomedical Engineering, Islamic Azad University, Tabriz Branch, Tabriz, Iran
4. Department of Mechatronic Engineering, Faculty of Mechanics, Tabriz University, Tabriz, Iran
Department of Biomedical Engineering, Electrical and Computer Faculty, Tabriz University, Tabriz, Iran
5. Department of Mechatronic Engineering, Faculty of Mechanics, Tabriz University, Tabriz, Iran
Department of Biomedical Engineering, Electrical and Computer Faculty, Tabriz University, Tabriz, Iran

University of Tehran

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