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PROCEEDINGS OF

VIRTUAL EVENT

GLOBAL CONGRESS ON ADVANCES IN POLYMER SCIENCE & NANOTECHNOLOGY

MAY 27-28

2021

Theme:

Enlightening the Advancements in the fields of Polymer Science, Chemistry and Nanotechnology

Peers Alley Media

1126 59 Ave East, V5X 1Y9, Vancouver BC, Canada

WhatsApp No: +1 873-889-8976

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ADV. POLYMERS 2021

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THE NEXT EVOLUTION IN RESEARCH

PROGRAM-AT-A-GLANCE

ADV POLYMERS 2021

DAY 1

THURSDAY, MAY 27, 2021

Scientific Program

BST – British Summer Time

10:00	**Title: Shape memory polymers in transition to programmable materials** **Thorsten Pretsch,** Fraunhofer Institute for Applied Polymer Research IAP, Germany
10:30	**Title: New polymerizable liquid crystals and their functional composites with nanoparticles** **Raisa V. Talroze,** A.V.Topchiev Institute of Petrochemical Synthesis, Russia
11:00	**Title: A green strategic design engineering for the fabrication of bio-based industrial materials** **S Ananda Kumar,** Anna University, India
11:30	**Title: Biopolymer treatment of wool fabric for shrink resistance** **Vinod Kadam,** ICAR-Central Sheep and Wool Research Institute, India
12:00	**Title: Structure and properties of chitosan based cellulose nanowhiskers grafted nanocomposite material via deep eutectic solvent in green chemistry** **Mubarak Mujawar,** Curtin University, Malaysia
Lunch Break 12:30-13:00	
13:00	**Title: Physical and chemical factors and reactions governing shape memory in shape memory alloys** **Osman Adiguzel,** Firat University, Turkey
13:30	**Title: Polymers in the development of supersaturating drug delivery systems** **Abhay T Sangamwar,** NIPER, India
14:00	**Title: Influence on the biological response of the architecture of grafted polymers onto titanium surfaces** **Caroline Pereira,** Institut Galilée, Université Sorbonne Paris Nord, France

14:30	**Title: Redox-sensitive polymeric nanomedicine of small molecule and miRNA for effective treatment of pancreatic cancer** **Ram I. Mahato,** University of Nebraska Medical Center, USA
Refreshment Break 15:00-15:30	
15:30	**Title: Impact of aging on mechanical strength and ductility of SLA additively manufactured parts** **Sunil Shanmugasundaram,** Stanford University, USA
16:00	**Title: Injectable and highly Stretchable hydrogels for sensing, drug delivery, and wound healing applications** **Hai-Feng Ji,** Drexel University, USA
16:30	**Title: Modification of PDMS with acrylic acid/ethylene glycol dimethacrylate mixtures by simultaneous polymerization assisted by gamma radiation for biomedical applications** **Marlene Alejandra Velazco Medel,** Universidad Nacional Autónoma de México, Ciudad Universitaria CDMX, México
17:00	**Title: Novel Functional Disposable Micropipette Tips for purifying biomolecules** **Mirna L. Sanchez,** Universidad Nacional Quilmes, Argentina
17:30	**Title: POLYVINYL ALCOHOL BEADSAS hosts for flower-like magnetic nanostructures** **Laura Mabel Sanchez,** Universidad Nacional de Mar del Plata (UNMdP), Argentina
18:00	**Title: Fabrication of Polypropylene /Lignin blend sponges via Thermally Induced Phase Separation** **Abeer Alassod,** Donghua University, China
End of Day 1	

DAY 2

FRIDAY, MAY 28, 2021

Scientific Program

BST – British Summer Time

10:00	**Title: Role of ethanol content in the polymerization of organic and inorganic monomers** **Samantha Lizette Flores López,** Instituto de Ciencia y Tecnología del Carbono INCAR-CSIC, Spain
10:30	**Title: About the ageing of polyethylene subject to plasma discharges: A DFT approach** **Giacomo Buccella,** Materials and Chemical Engineering "G. Natta" P.zza Leonardo da Vinci, Italy
11:00	**Title: Thermoelectric materials** **S. Mahalakshmi,** Vellore Institute of Technology, India
11:30	**Title: Biopolymer: Potential applications in bioremediation of cadmium contaminated waters** **Nadia Mahmoud Tawfiq Jebril,** University of Babylon, Iraq
12:00	**Title: An investigation of structural deformation on elastomeric profiles during extrusion process using finite element analysis** **Sujit Sharma,** Indian Institute of Technology Kharagpur, India
Lunch Break 12:30-13:00	
13:00	**Title: Novel flame retardant polymer preparation using ring-opening olefin metathesis reactions** **Ervin Kovács,** Institute of Materials Science, Research Centre for Natural Sciences, Hungary
13:30	**Title: High performance polyester from biobased 1,6-Hexanediol and sulfur containing monomer** **Wandji Djouoonkep Lesly Dasilva,** Wuhan University of Science and Technology, China

14:00	**Title: Biomedical applications of polymer-coated metallic nanoparticles** **Cristina Mariana URITU,** GrigoreT. Popa" University of Medicine and Pharmacy, Romania
14:30	**Title: Silicone breast implants: Grafting of a bioactive polymer to improve the bio-integration** **Mylan LAM,** Institut Galilée, Université Sorbonne Paris Nord, France
15:00	**Title: The aging behavior of two commercial conductive POLYTHIOETHER SEALANTS** **Sudhir Bafna,** Raytheon Technologies, USA
15:30	**Title: Modulation of tubulin polymerization into microtubules for optimized outcome in cancer nanomedicine** **Devika B. Chithrani,** University of Victoria, Canada
Refreshment Break 16:00-16:30	
16:30	**Title: Scalable production of polyhydroxybutyrate biopolymer from Cupriavidus necatorATCC 17697** **Daiana Nygaard,** Escuela de Ciencia y Tecnología, Universidad de San Martín, Argentina
17:00	**Title: Synthesis of ion exchange membrane by electrospinning technique - effect of the process parameters on the membrane properties** **Jesús Salvador Jaime Ferrer,** CIATEC A.C., México
17:30	**Title: Grafting of poly(*N*-vinylimidazole) and quaternized poly(*N*-vinylimidazole) onto cotton gauzes and its evaluation of antibacterial and pH-buffering medical devices** **Luis Alberto Camacho Cruz,** Universidad Nacional Autónoma de México, Ciudad Universitaria CDMX, México
18:00	**Title: Rheological impact and economic implications of partial to total substitution of imported bentonite clay for oil and gas drilling operations in Nigeria** **Oghenerume Ogolo,** African University of Science and Technology, Nigeria

18:30	**Title: Design and implementation of a crossflow turbine for PICO hydropower electricity generation** **Engr. Obiora C. Okafor,** Nnamdi Azikiwe University, Nigeria
19:00	**Title: Synthesis of Temperature and pH-Sensitive Polymers based on 2-Oxazolines and N-Isopropylacrylamide** **Juan Carlos Rueda S,** Pontifical Catholic University of Peru (PUCP), Peru

End of Day 2

Closing Remarks

3rd GLOBAL CONGRESS ON ADVANCES IN POLYMER SCIENCE AND NANOTECHNOLOGY

JUNE 23-24, 2022

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VIRTUAL EVENT

GLOBAL CONFERENCE ON ADVANCES IN POLYMER SCIENCE AND NANOTECHNOLOGY

May 27-28, 2021

Scientific Abstracts

Day 1

ADV. POLYMERS 2021

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Theme: "Enlightening the Advancements in the fields of Polymer Science, Chemistry and Nanotechnology"

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GLOBAL CONFERENCE ON ADVANCES IN POLYMER SCIENCE AND NANOTECHNOLOGY

May 27-28, 2021

Shape memory polymers in transition to programmable materials

T. Pretsch[1], D. Schönfeld[1], D. Chalissery[1], M. Walter[1], J. Köbler[2], H. Andrä[2], F. Wenz[3,4] and **C. Eberl[3,4]**

[1]Fraunhofer Institute for Applied Polymer Research IAP, Germany
[2]Fraunhofer Institute for Industrial Mathematics ITWM, Germany
[3]Fraunhofer Institute for Mechanics of Materials IWM, Germany
[4]IMTEK, University of Freiburg, Germany

Shape memory polymers (SMPs) can retain an imposed temporary shape after a thermomechanical treatment. When exposed to heat, the one-way shape memory effect (1W SME) is triggered and the polymer almost completely returns to its permanent shape.

Although the 1W SME has been known for a long time, it is still possible to identify applications where the material behaviour provides functional added value. Against this background, some examples will be given. Interestingly, with certain polyurethane-based SMPs that can be used to witness distinct 1W SMEs, a programming of two-way SMEs is also possible. Focusing the vision of selfsufficiently adaptable objects, novel systems were designed and SMPs synthesized, processed and demonstrators developed. We assume that this can initiate a paradigm shift in the future, in which the programming of a material is understood as the programming of a functionality. In fact, the internal structure of polyurethane-based SMPs can be controlled whereupon the material properties and behavior change reversibly according to a program. It is achieved by programming the reaction of the material to temperature signals into the polymer structure. In this way, completely new components with specific properties can be produced, which can be used in a wide variety of contexts. We gratefully acknowledge financial support from Federal Ministry for Economic Affairs and Energy, German Federation of Industrial Research Associations – AiF, grant numbers 19820 BR/1 and 20400 BG, and Fraunhofer Cluster of Excellence Programmable Materials CPM, grant numbers 630500 and 630519. T.P. wishes to thank the European Regional Development Fund for financing parts of the laboratory equipment (project 85007031).

Biography

Thorsten Pretsch has received his doctorate in Chemistry from the Free University of Berlin in 2004 and has been conducting research for more than 13 years in the field of shape memory polymers. Currently, he is deputy scientific coordinator at Fraunhofer Cluster of Excellence Programmable Materials CPM and responsible at Fraunhofer Institute for Applied Polymer Research IAP for both the division Synthesis and Polymer Technology and the working group Shape Memory Polymers.

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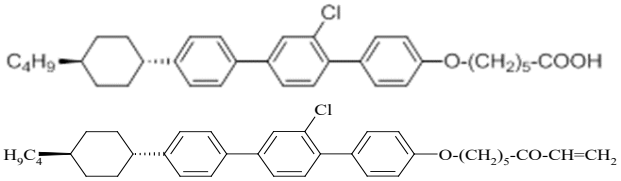
New polymerizable liquid crystals and their functional composites with nanoparticles

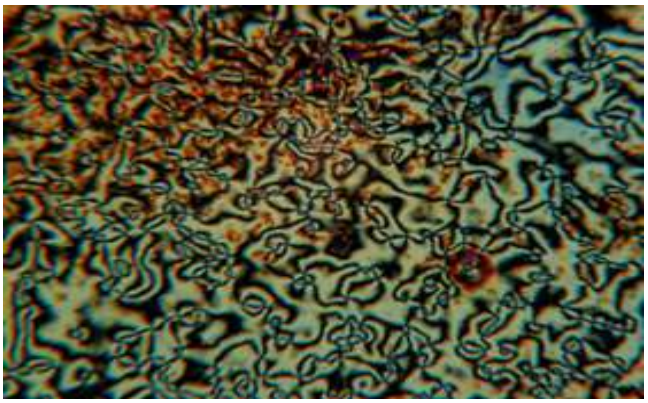
Prof R.V.Talroze[1], Dr. O.N. Karpov[1], Dr. Y.I. Derikov[1], G.A. Shandryuk[1] and **Prof V.S. Bezborodov[2]**

[1]A.V.Topchiev Institute of Petrochemical Synthesis, Russia
[2]Belarusian State Technological University, Belarus

One of the actual areas of the modern science is the search for perspective materials applied in different field of optical technology and microelectronics. Metamaterials characterized by structural order at different scales are considered as an example for such systems. One of the basic principles for the creation of metamaterials is the formation of composite structures including self-organized organic matrices and inorganic nanoelements. We report onan approach to construct new liquid crystals capable of LC polymer formation and containing functional groups to stabilize nanoparticles in the matrix. It is about new class of terphenyl derivatives of arylvinyl ketones and carboxylic acids. As an example we present chemical structure optical microphotograph of the nematic LC texture ofvinylketon and carboxylic acid having the same aromatic molecular fragments. We discuss conditions necessary to process the synthesis of new polymers together with the analysis of the molecular mass characteristics, polymer structure and miscibility with terphenyl-containing acids.

The table demonstrates the role of heating rate on the yield of temperatureinitiated polymerization of arylvinylketon. The polymerization





degree is equal 8 and it does not depend on the on the heating rate. The formation of new semiconductor nanoparticlesCdSe/ZnS stabilized by terphenyl molecules as chemically attached ligands and their optical properties areunder consideration. The results confirm that the anisotropic materials prepared on the base of new terphenyl derivatives may be considered as a source for the creation of new generation of nanocomposite materials.

Funding: The reported study was funded by RFBR and BRFBR, project number 20-53-0035.

Heating rate ˚C/min	Time, min	Start endotherm, ˚C	Finish endotherm ˚C	Yield, %
2.5	43.1	131.9	239.7	77.1
5	23.3	141.7	258.0	75.1
7.5	16.4	146.8	269.6	72.1
10	12.1	154.9	275.6	74.3
15	8.6	161.7	290.8	72.8

Biography

Prof. Raisa V. Talroze is a world known scientist in the broad field of polymer chemistry and physics, liquid crystals and nanomaterials based on semiconductor quantum dots and gold nanoparticles. She pioneered in investigations of main electro-optical effects in liquid crystal polymers, discovered new phenomena exhibited by LC polymer films related with thethermally activated re-connecting of H-bond structures. Her contribution in the field of nanoscience and nanotechnology allowed creating new polymer composite materials with embedded semiconductor and plasmonic nanoparticles. Her group in the Russian academy of sciences works on the synthesis of new materials, composite structures and structure-property relationship.

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A green strategic design engineering for the fabrication of bio-based industrial materials

S. ANANDA KUMAR and **N. SUNDAR**

Anna University, India

An attempt was made in the present study to synthesize a useful carbon filler from waste peanut shell by pyrolysis method carried out at 900°C. Bio-composite films were made using Polylactic acid (PLA) with a various weight percentage (1, 3, 5wt %) loading of Peanut Shell carbon (PSC) powder via solution casting method. The mechanical properties of PLA-PSC bio-composite films were determined by tensile strength, elongation at break, and film hardness. The DSC measurements indicated the semi-crystalline nature of PLA, which results in better barrier properties. PLA-PSC bio-composite films offer better barrier properties showing excellent water, oil, chemical resistance, and contact angle. The 5 wt.% of PSC loaded PLA film showed the best results to demonstrate its exemplary behaviour that is essentially required for producing industrially valuable Aluminium Oxide based coated abrasive and packaging materials.

Biography

Srinivasan Ananda Kumar completed his PhD at the age of 28 years from Anna University and postdoctoral studies from Demont Fort University, UK and Institute of Polymer Composites of University of Minho Portugal. He served as the Assistant Director of Centre for Entrepreneur Development (Overall activities), Anna University a premier organization. He has published more than 65 papers in reputed journals and has contributed eight book chapters for international publishers like CRC (USA), Apple Academic Press (USA), Wiley (Germany) and has also served as an editor for the book "Eco-friendly Nano-Hybrid Materials for Advanced Engineering Applications. He has completed several national and international projects funded by DST, DRDO and Anna University. He received "Active Researcher Award for the year 2014 from His Excellency (Late) Dr. A P J Kalam for his outstanding contribution in nano-hybrid coatings and composites. His team won the Runners-up Award for technology Innovation in Nano-materials from HonorableCentral Minister Anandh Kumar in the year 2015. He supervised four PhD students who have received Doctoral Degree in science and Humanities. He is the reviewer for several international journals viz, Chemistry of Materials, Progress in Organic Coatings, Electrochemical Acta, Polymer Composites etc., He has been acting as consultant for an American Company for their new product development. He was a member of American Nono-Society and an active member of Society for polymer Science, Chennai.

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Biopolymer treatment of wool fabric for shrink resistance

V. Kadam[2], S.Rani[1], N.M. Rose[3], S. Yadav[4], N. Shanmugam[5] and **D.B. Shakyawar[6]**

[1,2,5]ICAR-Central Sheep and Wool Research Institute, India
[3,4]CCS Haryana Agricultural University, India
[6]ICAR- National Institute for Natural Fibre Engineering and Technology, India

Wool fabric is known for its luxury and unique properties like breathability, excellent thermal insulation, flame retardancy, thermo-regulation, and comfort properties. However, poor dimensional stability is one of the major limitations of wool fabrics that is caused by the progressive fibre entanglement in the wool fabric. Thus, there is an imperative need to develop a treatment that not only prevents the wool from felting but also takes care of nature and textile material itself. Therefore, the present study was undertaken to impart dimensional stability to wool fabric using eco-friendly biopolymers. Wool fabric samples were coated using chitosan, corn starch, gum arabic, polyvinyl alcohol, sodium alginate and wheat starch, biopolymers with 0.5 % (on the weight of fabric) concentrations. The biopolymer treatment was carried out with the pad-dry-cure method at 100 % expression keeping a 1:30 material to liquor ratio. The dimensional stability was measured after washing that includes one relaxation cycle and three felting cycles. The treated wool fabrics were characterized using Field Emission Scanning Electron Microscopy (FE-SEM) and Fourier Transform Infrared spectroscopy (FTIR) analysis. The tensile, frictional, and bending properties of treated wool fabrics were also analyzed. Among all, the wheat starch coated sample exhibited 3.58 % area shrinkage as compared to the untreated sample (11.00 %). This may be due to the presence of biopolymer coating on the surface of wool fibres that may reduce the probability of scales interlocking during laundering. It was concluded that biopolymer treatment imparts anti-felting wool fabric. Thus, biopolymer treatments can be used for developing shrink-resistant wool fabric without any adverse effect on fabric properties.

Biography

Vinod Kadam is a scientist at the central sheep and wool research institute, India. Vinod's research interest is in wool fibre science, biopolymers and nanofibres. He is trying to find eco-friendly alternatives of wool fibre processing along with value addition to non-textile grade wool using renewable materials and sustainable technologies. He holds a Ph.D. from RMIT University, Australia. Vinod won the best paper award for his work on nanofibres at the international conference in Rome in 2017. He has awarded for "best scientific work" from the institute and "outstanding contribution to society award" from the institution of engineers (India) in 2021. He wrote twenty research papers, six book chapters, and edited one book. Vinod is also helping two Ph.D. students to shape their research work. His current research focus is on the use of biopolymers to provide dimensional stability of wool and coarse wool reinforced biocomposites.

Structure and properties of chitosan based cellulose nanowhiskers grafted nanocomposite material via deep eutectic solvent in green chemistry

N.M. Mubarak and **Xin Xiong Chang**

Curtin University, Malaysia

The idea of green solvent reflects the aim of reducing the environmental effect from the application of solvents in the chemical production. The synthesis of CNW/chitosan nanocomposite films via DES present changes in the chemical structures. A pure chitosan film has broadband at 3180 to 3400 cm-1 which indicate the presence of amide and hydroxyl group. With incorporation of CNW, the peak shift to the greater wavelength and turn sharper and stronger. The addition of DES infuses more element of amide into the nanocomposite films. For the mechanical properties, the incorporation of CNW filler into chitosan matrix presents an enhancement in term of Young's Modulus, tensile strength, and elongation at break. The Young's Modulus and tensile strength are increased while the elongation break is decreased as the incorporation of CNW concentration increase. However, the application of DES result in a lower Young's Modulus and tensile strength as the films is hygroscopic. As conclusion, DES is considered as the new solvent media in the synthesis application in Green chemistry. It has the potential to replace IL due to its biodegradability and non-toxic properties while preserving the characteristic of low vapour pressure. Besides that, chitosan is the potential materials to be applied in various industry such as biomedical and pharmaceutical industry. The more CNW concentration incorporated into the chitosan films, the more the enhancement of mechanical properties.

Biography

Dr.Nabisab Mujawar Mubarak is an Associate Professor in the Faculty of Engineering and Science, Curtin University, Malaysia. He serves as a scientific reviewer in numerous journals in the area of Chemical Engineering and Nano Technology. In research, Dr. Mubarak has published more than 190 journal papers, 23 conference proceedings and authored 25 book chapters. His area of interest is carbon nanomaterials synthesis, magnetic biochar production using microwave and wastewater treatment using advanced materials. He is a recipient of the Curtin Malaysia Most Productive Research award, outstanding faculty of Chemical Engineering award, Best Scientific Research Award London and outstanding scientist in publication and citation by i- Proclaim, Malaysia. Dr. Mubarak is a Fellow Member of The Institution of Engineers Australia, Chartered Professional Engineer (CPEng) of The Institution of Engineers Australia and also a Chartered Chemical Engineer of the Institute of Chemical Engineering (IChemE) UK.

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Physical and chemical factors and reactions governing shape memory in shape memory alloys

O. Adiguzel

Firat University, Turkey

Metallic alloys, and other alloys have different phases at different conditions and these phases are described in phase diagrams as alloy composition-temperature, or composition-pressure dependent. Shape memory alloys are also at different phases depending the alloy compositions and exhibit a peculiar property called shape memory effect in β-phase region. These alloys are very sensitive to temperature and other external conditions, and crystal structures turn into the other structures with the variation of temperature and stressing. On cooling, the ordered parent β phase structures turn into twinned martensite structure along with lattice twinning by means of thermal induced martensitic transformation, and twinned structures turn into the detwinned martensite structure by means of stress induced martensitic transformation with deformation. Lattice vibrations (phonons), atomic bonds and interatomic interactions play an important role in the processing of transformation. These interactions are described by potential functions between atom pairs, pair wise potential function and embedded atom electron cloud potential functions.Thermal transformation occurs in atomic scale in the material on cooling from parent phase region, and interatomic interactions govern this transition. Shape memory is characterized by the recoverability of two certain shapes of material at different temperatures. These alloys possess two unique abilities: the capacity to recover large strains and to generate internal forces during their activation. The basis of this phenomenon is the stimulus-induced phase transformations, martensitic transitions, which govern the remarkable changes in internal crystalline structure and properties of the materials. These alloys exhibit another property called superelasticity, which is performed in only mechanical manner by deforming material in parent phase region and recover the original shape on releasing the stress in superelastic manner.

Copper based alloys exhibit this property in metastable β-phase region. Lattice invariant shear is not uniform in copper-based shape memory alloys, and these types of shears gives rise to the formation of layered structures, like 3R, 9R or 18R depending on the stacking sequences on the close-packed planes of the ordered lattice.

In the present contribution, x-ray diffraction and transmission electron microscopy (TEM) and differential scanning calorimetry (DSC) studies were carried out on two copper based CuZnAl

and CuAlMn alloys. X-ray diffractograms taken in a long-time interval show that locations and intensities of diffraction peaks change with the aging time at room temperature. This result refers to the rearrangement of atoms in diffusive manner.

Biography

Dr Adiguzel graduated from Department of Physics, Ankara University, Turkey in 1974 and received PhD- degree from Dicle University, Diyarbakir-Turkey. He has studied at Surrey University, Guildford, UK, as a post-doctoral research scientist in 1986-1987, and studied on shape memory alloys. He worked as research assistant, 1975-80, at Dicle University and shifted to Firat University, Elazig, Turkey in 1980. He became professor in 1996, and he has already been working as professor. He published over 80 papers in international and national journals; He joined over 100 conferences and symposia in international and national level as participant, invited speaker or keynote speaker with contributions of oral or poster. He served the program chair or conference chair/co-chair in some of these activities. In particular, he joined in last seven years (2014 - 2020) over 70 conferences as Keynote Speaker and Conference Co-Chair organized by different companies. He supervised 5 PhD- theses and 3 M.Sc- theses.

Dr. Adiguzel served his directorate of Graduate School of Natural and Applied Sciences, Firat University, in 1999-2004. He received a certificate awarded to him and his experimental group in recognition of significant contribution of 2 patterns to the Powder Diffraction File – Release 2000. The ICDD (International Centre for Diffraction Data) also appreciates cooperation of his group and interest in Powder Diffraction File.

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Polymers in the development of supersaturating drug delivery systems

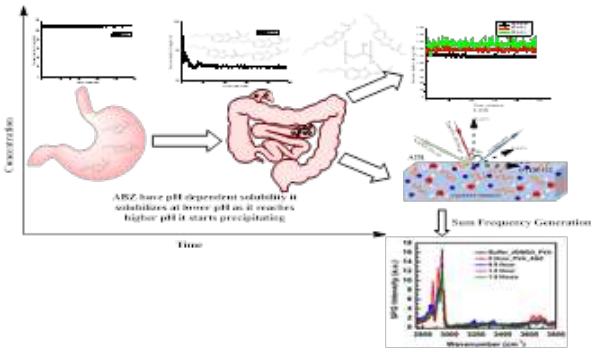
Abhay T Sangamwar
NIPER, India

Objective: Supersaturation is the phenomenon which addresses the poor aqueous solubility of drugs. However, supersaturation tends to crystallize because of drugs thermodynamic instability thereby compromising the solubility and biopharmaceutical performance of drugs. There is a need to stabilize the supersaturated state by interfering with the precipitation process via delaying the nucleation and crystal growth of dissolved drug molecules. Polymers as precipitation inhibitors have been explored to develop supersaturating drug delivery systems (SDDS). The mechanisms through which polymers stabilize the supersaturated drug solutions depends on the chemistry of drug and polymers and thus hydrogen bond formation between drug and polymers, polymer adsorption onto the crystal surface, formation of drug metastable polymorphs and electrostatic interactions.

Methods: The acquired supersaturated precipitates (PPT) of drugs in the presence of selected polymers are characterized for solid-state properties to observe the nature of drug using thermal, crystallographic and microscopic techniques. Further, the drug-polymer interplay revealed using various spectroscopic techniques and the unexplored molecular level insight at air-aqueous interface is unveiled using sum frequency generation vibrational spectroscopic tool (SFG).

Results: The representative supersaturated solution of albendazole is presented here.

The PVA and PVPK 30 are effective precipitation inhibitors



Biography

Dr Abhay Sangamwar studied pharmacy and did his PhD in pharmacy in 2006. He served pharmaceutical industry for 3 years and the Department of Pharmacoinformatics, NIPER, SAS Nagar from 2009 to 2014 as Assistant Professor. During this tenure he explored in silico techniques in drug binding with CYP/UGT/efflux-influx transporters/hPXR. In 2014 he joined the Department of Pharmaceutics. His research focuses on mainly three areas which include supersaturated drug delivery systems of BCS class II drugs, development of salt amorphous solid dispersions and phospholipid bile salt mixed micelles in the delivery of drugs. So far, he published his work in more than 85 articles in peer reviewed, international scientific journals, 25 poster presentations and 10 oral presentations at national and international scientific meetings. One book chapter is credited to him. His awards include German Academic Exchange Service (DAAD) fellowship for research stay in Germany.

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Influence on the biological response of the architecture of grafted polymers onto titanium surfaces

C. Pereira, C. Falentin-Daudré and **V. Migonney**

Institut Galilée, Université Sorbonne Paris Nord, France

Titanium is widely used in orthopedic implants for its good corrosion resistance and its biocompatibility with human tissues. Nevertheless, despite stringent hygiene rules, 1.5 % of the implanted prosthesis is still prone to bacterial infections. In order to overcome this problem, different techniques have been proposed to modify the surface of the titanium. Bioactive polymers such as poly (sodium styrene sulfonate) (polyNaSS) have good antibacterial properties and improve osseointegration properties. In this context, we have developed three different techniques for covalent grafting of polyNaSS onto titanium (Ti) surfaces (Figure 1) to study the influence of the grafted polymer's architecture on the biological response. [1] Two of them are "grafting from" techniques requiring an activation step either by thermal or UV irradiation. The third method is a "grafting to" technique involving an anchorage molecule onto which the bioactive polymer (polyNaSS) synthesized by reversible addition-fragmentation chain transfer (RAFT) polymerization is clicked. The advantage of this third method is the ability to control the grafted polymers' architecture and length on the Ti surface and their influence on the biological responses. [2-3] Using these three techniques of grafting, we were able to study the biological responses of the bacterial inhibition. The results showed that the biological responses were different between direct and indirect grafting and that the size of the grafted polymers influenced the biological response.

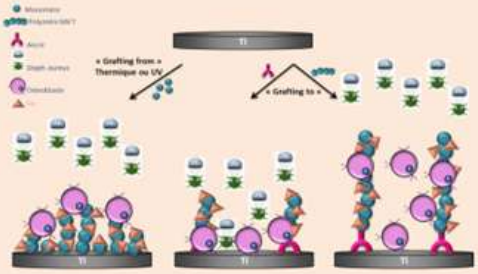

Figure 1 : Different techniques to graft bioactive polymer on titanium surfaces

Biography

Caroline Pereira is a second-year Ph.D. student. Her doctoral research investigates the development of innovative titanium hybrid structures using the grafting of bioactive polymers for biomedical applications at Sorbonne Paris Nord University. In 2019, she obtained a Master degree in Material Chemistry at Sorbonne University.

Redox-sensitive polymeric nanomedicine of small molecule and miRNA for effective treatment of pancreatic cancer

Ram I. Mahato

University of Nebraska Medical Center, USA

Desmoplastic and hypoxic pancreatic cancer microenvironment induces aberrant expression of miRNAs and hypoxia-inducible factor-1α (HIF-1α) responsible for resistance to gemcitabine (GEM). We demonstrated that miR-519c was downregulated in pancreatic cancer, and transfection of miR-519c in GEM-resistant pancreatic cancer cells inhibited HIF-1α level under hypoxic conditions. Redox-sensitive micelles allow controlled drug release in the presence of intracellular stimuli, hence, we synthesized mPEG-co-P(Asp)-g-DC-g-S-S-GEM polymer, with GEM payload of 14% w/w and 90% GEM release from the polymer upon incubation with L-glutathione (GSH). GEM conjugated micelles, compared to free GEM and non-redox sensitive mPEG-co-PCC-g-DC-g-GEM, showed enhanced cytotoxicity on MIA PaCa-2R cells. Chemical modification enhanced its stability and activity without being immunogenic. EGFR targeting peptide decoration increased tumor accumulation of micelles after systemic administration. GE11 decoratedredox-sensitive mixed micelles carrying GEM and miR-519c significantly inhibited orthotopic desmoplastic pancreatic cancer growth in mice by downregulating HIF-1α and genes responsible for glucose uptake and cancer cell metabolism. Our multifunctional nanomedicine of GEM and miR-519c offers a novel therapeutic strategy to treat desmoplasia and hypoxia-induced chemoresistance in pancreatic cancer. Finally, factors influencing stability, drug/miRNA loading, pharmacokinetic profiles, therapeutic efficacy and toxicities in mouse models will discussed.

Biography

Ram I. Mahato is a Professor and Chairman of the Department of Pharmaceutical Sciences, University of Nebraska Medical Center, Omaha, NE. He was a professor at the University of Tennessee Health Science Center, Research Assistant Professor at the University of Utah (with Sung Wan Kim), Senior Scientist at GeneMedicine, Inc., and as a postdoctoral fellow at the University of Southern California in Los Angeles (with Vincent HL Lee), Washington University in St. Louis, and Kyoto University, Japan (with Mitsuru Hashida). He received PhD in Drug Delivery from the University of Strathclyde, Great Britain and BS from China Pharmaceutical University, Nanjing. He has published 164peer reviewed papers, 24 book chapters, holds 3 US patents, and has edited/written nine books and eleven journal issues (Total Google Citations= 11,484 and h-Index =63). He is an Associate Editor of the Journal of Neuroimmune Pharmacology, was a Feature Editor of the Pharmaceutical Research (2006-2013) and is the Editorial Board Member of eight journals. He is a CRS Fellow (2011), AAPS Fellow (2010), Permanent Member of BTSS/NIH Study section (2009-2013), and ASGCT Scientific Advisor (nonviral vectors, 2006-2009). He is applying sound principles in pharmaceutical sciences in the context of the latest advances in life and material sciences to solve challenging drug delivery problems in therapeutics. His areas of research include delivery and targeting of small molecules, miRNA and genes using novel polymeric and lipid carriers for treating cancer, liver fibrosis and diabetes.

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VIRTUAL EVENT

GLOBAL CONFERENCE ON ADVANCES IN POLYMER SCIENCE AND NANOTECHNOLOGY

May 27-28, 2021

Impact of aging on mechanical strength and ductility of SLA additively manufactured parts

Sunil Shanmugasundaram[1], Jafar Razmi[2] and **Leila Ladani[2]**

[1]Stanford University, USA

[2]Arizona State University, USA

In this study, the degree of mechanical anisotropy was investigated through tensile testing of specimens built in different orientations and designed according to the ASTM D638 standard. The mechanical properties that were evaluated include Young's modulus, ultimate tensile strength (UTS), and percentage elongation. Additionally, physical properties, such as mean surface roughness (Ra), density and dimension of the cross-sectional area, were also measured. The obtained modulus of elasticity and UTS values of the printed samples were 2481 ± 50 MPa and 51.9 ± 1.3 MPa respectively, which were very similar to the standard data (2550 and 52 MPa, respectively) as provided by the material suppliers. The percentage elongation values (4.8% ± 0.4%) were a bit lower than the expected value of 6%. However, the surfaces of all the printed samples were quite smooth, with a surface roughness range of 2.28 ± 0.59 µm. A design of experiments was created to study the influence of the independent variables such as build orientation and angular orientation on the mechanical properties. Extensive statistical analysis, using the Taguchi method and analysis of variance (ANOVA), was performed to examine the effect of these independent variables on the mechanical properties. The SLA printed parts can be classified as isotropic since the build orientation and the angular orientation did not have a statistically significant impact on the mechanical properties. The effect of aging on the mechanical properties was also evaluated and it shows that the specimens that had been aged for a longer time resulted in superior mechanical properties. For example, the UTS increased from 24 to 54 MPa when the sample aligned parallel to the XY plane was aged from 1 week to 6 months, respectively. The resin used for this study, Visijet SI Clear, produced very consistent mechanical properties in different directions.

Biography

Sunil Shanmugasundaram's research focuses on the characterization of materials subjected to tensile loads and the tailoring of build parameters of 3D printers. His research interests include the optimization of different Additive Manufacturing (AM) techniques to achieve an optimum combination of mechanical properties as per functionality desired. His experience spans between academia and industry through research projects and internships in automotive servicing operations, data analytics, robotic process automation, and AM. He is also interested in traditional manufacturing techniques, supply chain management, and product design methodologies. He is currently involved in the application of design thinking principles to achieve higher performance in design teams. He received his B.S in Mechanical Engineering from the University of Texas at Arlington and is currently doing his M.S in Mechanical Engineering at Stanford University specializing in both manufacturing and product design.

Injectable and highly stretchable hydrogels for sensing, drug delivery, and wound healing applications

Hai-Feng Ji

Dept. Chem. Drexel University, USA

Traditional injectable hydrogels made of chitosan have relative smaller tensile strength lower elasticity compared to highly stretchable elastomers. This work focuses on the development of a new hydrogel based on a recently discovered tough hydrogel. This new type of hydrogel may serve as a remarkable injectable hydrogel material for with high elasticity and durability. Some applications of this hydrogel, including sensing, drug delivery, wound healing, etc. will also be discussed.

Biography

Dr. Ji is current a professor of Department of Chemistry, Drexel university. His research interests focus on MEMS devices, hydrogels, nanomaterials for energy and environmental applications, drug discovery, and surface chemistry. He is currently a co-author of over 190 peer-viewed journal articles and book chapters. He has co-authored 6 US patents, two of which have been licenced to companies. He has an H-index of 36. He is an editorial board member of several chemistry journals.

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May 27-28, 2021

Modification of PDMS with acrylic acid/ ethylene glycol dimethacrylate mixtures by simultaneous polymerization assisted by gamma radiation for biomedical applications

M.A. Velazco-Medel, L.A. Camacho Cruz and **Emilio Bucio**

Universidad Nacional Autónoma de México, Ciudad Universitaria CDMX, México

The addition of hydrophilic functional groups to hydrophobic polymers has been extensively used for the development of new medical devices with potential applications. Different techniques have been employed to modify polymeric matrixes, including conventional chemistry (coupling or substitution reactions, free radical, etc.) or ionizing radiation (ultraviolet and gamma rays).

Acrylic acid (AAc) derived polymers present high swelling degree and pH responsiveness, due to the carboxylic groups in its structure; it has been grafted onto a wide range of polymeric matrixes, such as polydimethylsiloxane (PDMS) and polytetrafluoroethylene (PTFE).

The PDMS is vastly used int the biomedical line, for the manufacturing of devices as catheters of gastric bags, it is highly hydrophobic and this promote ease bacterial adhesion, the incorporation of hydrophilic or antimicrobial moieties has been studied.

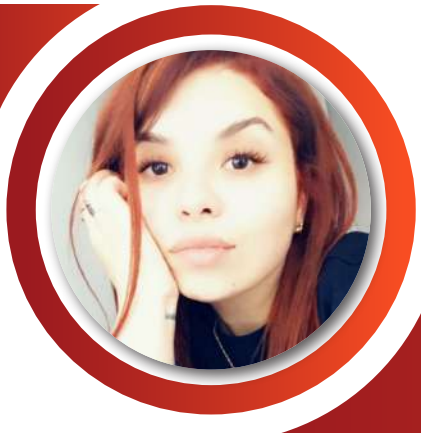
This work presents the modification of PDMS with AAc and ethyleneglycoldimethecrylate (EGDMA) as major component and as cross linking agent by using gamma radiation, absorbed dose and concentration were studied to obtain optimal materials with improved response. The molar ratio (AAc/EGDMA) was modified to investigate the effect of the monomer concentration of EGDMA in the swelling behavior and equilibrium water content. Swelling studies showed the typical pH responsiveness of AAc polymers, and it is a promising feature exploited for drug loading.

Using contact angle measurements, the surface wettability of the different films was studied, the EGDMA concentration directly affects the wettability of the surface due to the cross linking effect. These results are in accordance with the thermal behavior of the materials.

The availability of acidic groups on the surface of the materials was tested by potentiometric titrations until equilibrium, demonstrating the effect of the AAc/EGDMA molar ratio in the type of grafting reaction. The results showed a bulk grafting reaction is preferred when increasing the EGDMA concentration, the diffusion of AAc is favored rather than EGDMA.

Biography

My name is Marlene Velazco Medel, I'm a Ph. D. student in the Nuclear Science Institute at the UNAM. My under graduate and master studies were about organic synthesis and click chemistry in the faculty of chemistry of the UNAM too. I have got experience with computational chemistry and rational drug design. Now, I am working with the modification of polymeric matrixes for biomedical purposes, my doctoral work is focused on PDMS, and I am trying to immobilize metallic nanoparticles and drugs onto the surface, without further modification of the PDMS properties. Finally, I was born in Jalisco, and I lived in Colima, Mexico all my life, until Master studies started. I am a chemical pharmacist from the Universidad de Colima. I love swimming.



Novel functional disposable micropipettetips for purifying biomolecules

Mirna L. Sanchez

Universidad Nacional Quilmes, Argentina

A novel functional micropipette tip for DNA purification, called DNAtip, is described based on a novel coating process. The functional layer is prepared by an internal coating with silica particles supported into a polyvinyl alcohol (PVA) film. The coating layer is stabilized by simultaneous radiation-induced crosslinking to avoid its dissolution. Three types of silica particles of different diameters: micron, sub-micron, and nano sizes are studied. In addition, pH of the coating solution and concentration of the silica particles were optimized. Tips coated with fumed silica showed the highest absorption capacity of a plasmid DNA with an acceptable purity. Different linear dsDNA fragments were used for evaluating the absorption capacity and size discrimination of fragments. The recovery in the range of 700 ng and 200 ng per tip was measured for dsDNA fragments in the range of 400 bp to 2 kbp and 50 bp to 500 bp respectively. DNA PCR fragments contaminated with BSA were successfully purified with sufficient quality to be sequenced or enzymatically digested. This disposable tip device, useful for plasmids or DNA fragments purification, is a novel lab-on-a-tip device, which can effectively improve automate genetic engineering procedures.

Biography

Prof.Dr. Mirna L. Sanchez is 34 years old and comes from Argentina. She is part of the Biotechnological Materials Lab, Universidad Nacional de Quilmes and member of the National Council of Technical and Scientific Research (CONICET). She is specialist in the development of polymeric coatings for conferring functionality to several materials. She has worked in different countries as Germany and México. Author of many scientific papers and two patents is a stronger supporter of the bio-entrepreneurship. DAAD alumni, visiting professor of the Tecnológico de Monterrey and professor in Universidad Nacional de Quilmes, she has a wide experience in polymeric coatings, modified materials by gamma-induced polymerization, material characterization and hydrogels.

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May 27-28, 2021

POLYVINYL ALCOHOL BEADSAS hosts for flower-like magnetic nanostructures

Laura M. Sanchez[1], Camila Pereda[1], Daniel G. Actis[2], Pedro Mendoza Zélis[2] and Vera A. Alvarez[1]

[1]Instituto de Investigaciones en Ciencia y Tecnología de Materiales (INTEMA), CONICET - Universidad Nacional de Mar del Plata (UNMdP), Argentina

[2]Instituto de Física de La Plata (IFLP), CONICET-Departamento de Física, Universidad Nacional de La Plata (UNLP), Argentina

Dye pollutants sources are usually related to wastewaters from the dying, printing and textile industries. Since the need for their removal from polluted water is widely recognized, a variety of methodologies and treatments have been researched. Among them, water remediation through adsorption processes is considered a promising alternative from costs, operational complexity and reusability points of view. Adsorbents should be as green as possible and at the same time they should be able to perform an efficient water treatment.

The authors have previously prepared and studied magnetic polyvinyl alcohol (PVA) hydrogels that were capable of removing methylene blue (MB) from aqueous model systems. However, the materials were completely incapable of removing anionic dyes. Then, in the very beginning of this investigation, the authors desired to employ similar starting materials and to change the magnetic nanoparticles (MNPs) content. Then, magnetic beads were generated instead of magnetic films, looking for increasing the contact surface between the adsorbent and the

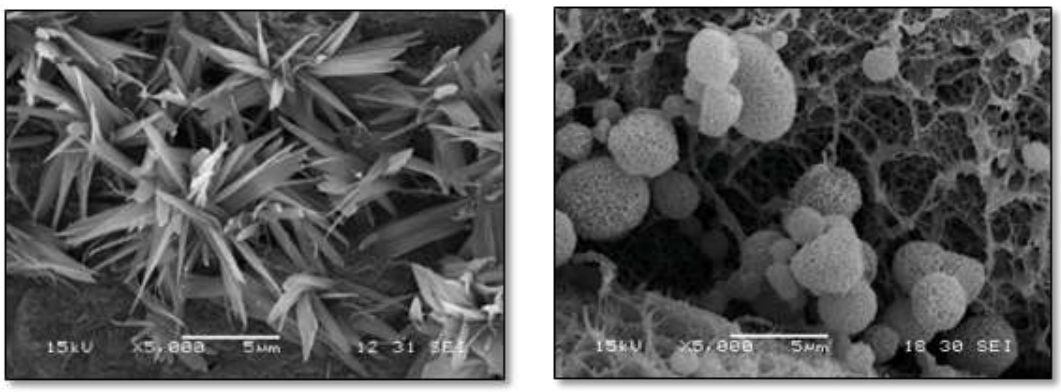

Figure 1. *SEM micrographs (5000x): Left) Hydrated sample; Right) Dried sample*

polluted solution. As a result, the developed materials were completely characterized and tested as both cationic (MB) and anionic (methyl orange, MO) dyes adsorbents from aqueous model solutions conveniently prepared. The obtained magnetic beads exhibited self-oriented Tillandsia Aeranthos-like flowers and porous spheres both being composed by iron oxides(Figure 1). Even though other researchers have prepared this kind of iron oxide-based nanomaterials, it is important to remark that they were not formed inside a polymeric matrix.

It was observed that the efficiency towards the removal of MB (> 80%) is higher than the corresponding to MO (< 30%), but it is possible to affirm that the magnetic materials have certain versatility to act as adsorbents.

Biography

Laura Mabel Sanchez has completed his PhD at the age of 27 years from National University of La Plata (Argentina), and postdoctoral studies from National University of Mar del Plata (Argentina). Nowadays, she is a Researcher with permanent position at the National Research Council (CONICET) and she also teaches Organic Chemistry classes at National University of Mar del Plata (Argentina). She has published more than 40 scientific documents including articles, books, reviews and book chapters. Laura has been scholar from Fulbright, Bunge y Born,SEGIB Carolina and Santander Foundations. Dr. Sanchez has demonstrated research experience in Green Chemistry and Green Engineering fields. Currently, she is focused on the development of eco-compatible nanocomposite materials for environmental remediation purposes.

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May 27-28, 2021

Fabrication of Polypropylene /Lignin blend sponges via Thermally Induced Phase Separation

Abeer Alassod[1], Syed Rashedul Islam[1], Eshraga A. A. Siddig[2] and Guangbiao Xu[1]

[1]College of Textiles, Donghua University,China
[2]New Energy and Material Devices, Donghua University, China

Polypropylene is commonly used plastic in different industrial applications, especially wastewater treatment as sorbents, mainly due to excellent characteristics such as low cost, high oil sorption capacity, and quite a high efficiency. However Still, their nonbiodegradability and non-renewability after use are unacceptable to introduce new pollutants while solving environmental disasters. For this point, using renewable alternative materials to Polypropylene has motivated the interest in the potential use to reduce the environmental problem. In this work, Lignin was chosen as the second blend in the polymer matrix due to being renewable, biodegradable, biocompatible, cheap, and wide available. An environment-friendly method named thermally induced phase separation (TIPS) has been adopted to blend Lignin with Polypropylene in different levels loading 0, 10, 20 % wt. The successfully new sorbents had been compared in terms of morphological, chemical, and wetting characterizations.

Novel porous sponges based on economically and commercially available PP and Lignin were successfully fabricated via the TIPS method. Based on the results, Morphological analysis (SEM) observed an interconnected porous network that acts as a capture site of oil, and Lignin merged into PP. FTIR analysis indicated successful physical mixing of different lignin concentrations with preserved the chemical structure of the polymer was confirmed by FTIR analysis incorporated Lignin with different loading 10, 20 wt% in the polymer composites showed a reduction in water contact angle. The measured water contact angle of PP, PP10L, and PP20L was found to be 127.4°, 113.89 °, and 107 °, respectively. This result may be demonstrated by the existence of polar hydroxyl and carboxylic groups on the lignin structure, where the water droplets relatively quickly adsorbed and disappeared. However, the obtained results of angles still greater than 90° indicate a hydrophobic feature. These excellent features make Polypropylene /Lignin blend monoliths more competitive promising candidates than commercial absorbents

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May 27-28, 2021

Scientific Abstracts

Day 2

Role of ethanol content in the polymerization of organic and inorganic monomers

S.L. Flores-López[1], S.F. Villanueva[1], Natalia Rey-Raap[2], Lucía dos Santos-Gómez[2] and **Ana Arenillas[1]**

[1]Instituto de Ciencia y Tecnología del Carbono INCAR-CSIC, Spain
[2]Department of Physical and Analytical Chemistry, Oviedo University-CINN-CSIC, Spain

The analysis of the variables involved in the synthesis of polymeric materials, as well as their impact on the final properties of the material, are of great importance. This knowledge is the basis for the design and development of advanced polymers with a wider range of applications. The response to these variables may depend on the nature of the monomers involved, therefore their convergence can become a challenge during the development of hybrid materials. Such is the case of silica (Si) and resorcinol-formaldehyde (RF) polymers, which have been developed in different systems (i.e., alcohol- and water-based). The use of reactants that stabilize the mixture and promote rapid polymerization has made it possible to obtain RF-Si hybrids from an alcohol-based solution [1]. However, this strategy increases production costs, which prevents its further commercialization. This work evaluates the use of a hydro-alcoholic precursor solution. In addition, the effect of ethanol content and their interaction with the different species (i.e. organic and inorganic monomers) is evaluated in the mixture and separately. The ethanol content was shown to influence the homogeneity of the mixture, the synthesis time and the final properties of the materials. This design variable, together with those already known (i.e., pH, dilution ratio, molar ratios, etc.), enhances the versatility and control in the production of RF-Si polymers. Taking that into account, a one-pot and fast synthesis of versatile polymers materials is possible by microwave heating. This approach provides greater scope for these materials in applications such as catalysis, separation or electrochemistry.

Biography

Samantha Flores was born in Colima, Mexico in 1990. After finishing her studies in Biochemical Engineering at the Technological Institute of the same city in 2014, she moved to Aguascalientes, where she studied a Master of Science in Chemical Engineering. In 2016, she began her working life in the company Carbotecnia (Guadalajara, Mexico), dedicated to the manufacture of active carbon and the commercialization of products for water treatment. In this period, she had the opportunity to collaborate within the acquisition and the technical departments, dedicating the last year of this experience to the development of projects, installing and commissioning. She is currently a PhD student, collaborating within the research groupMCAT at INCAR-CSIC (Spain).

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May 27-28, 2021

About the ageing of polyethylene subject to plasma discharges: A DFT approach

G. Buccella[1], A. Villa[2], D. Ceresoli[3], L. Barbieri[2] and R. Malgesini[2]

[1]Department of Chemistry, Materials and Chemical Engineering "G. Natta", Italy
[2]Research Energy System - RSE, Italy
[3]Consiglio Nazionale delle Ricerche, Istituto di Scienze e Tecnologie Chimiche, Italy

We present a computational modelling of the chemical phenomena involved in the ageing process of polyethylene (PE) subject to reactive plasma. PE is one of the most used polymeric insulators in electrical power industry, but under the stress associated with AC power supplies, it undergoes ageing. It is believed that ageing is due to the interaction between PE walls and a reactive plasma formed by partial discharges (PDs) within air-voids embedded in the matrix. The interactions of plasma species with the solid may lead to chemical reactions or surface sputtering. The latter generates the defect propagation and the formation of chain fragments diffused in the gas. We have considered an approach based on first-principles molecular dynamics (FPMD) simulations for the modelling. We have investigated the effects deriving from the collision of several plasma species (air-plasma ions, NO radical and C-based species) with PE surface. Each collision of each species have been reproduced by considering the variation of different parameters such as the electric field E (i.e. the starting velocity), molecular orientation and surface impact angle. The impacts of the ion series have shown different outcomes depending on the chemical properties of the species and the applied E. The chemical reactions have been observed with $E < 10$ MV/m, whereas with $E \geq 10$ MV/m, the sputtering has always been obtained. FPMD calculations have reproduced the chemisorption of NO on oxidized PE, which could contribute to explaining the experimentally detected N/C ratio at the surface. FPMD simulations considering C-based fragments derived from sputtering have shown the tendency of these species to deposit and stratify on PE, maybe increasing surface conductivity. Building on the present work by examining more cases will lead to a more complete vision of the chemical phenomena that can take place at different times or in rapid succession.

Biography

During the Bachelor and Master degrees, which I conducted under Prof. Michele Ceotto and Dr. Leonardo Lo Presti supervision at Università degli studi di Milano, I was introduced to Density Functional Theory, and basic principles of XAS. From December 2017 to December 2018 I worked on my Master thesis under Dr Lo Presti's supervision. Currently, I am doing my Ph.D. under the supervision of professor Giovanni Dotelli at Politecnico di Milano, in collaboration with the research centre Ricerca sul Sistema Energetico, (RSE S.p.a.) after winning a scholarship for the project titled : "Modeling of chemical and physical processes associated with the phenomenon of partial discharges and ageing of dielectric materials".

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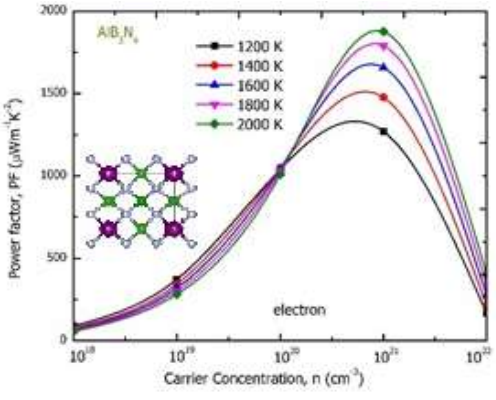
May 27-28, 2021

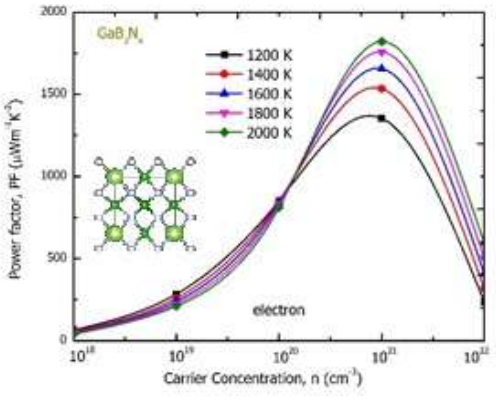
Thermoelectric materials

S. Mahalakshmi[1] and **P Iyyappa Rajan**[2]

[1]*Vellore Institute of Technology, India*
[2]*Asia Pacific Center for Theoretical Physics, POSTECH Campus, Republic of Korea*

With wealth of information available about low- and mid- temperature applications, the current focus is on high temperature thermoelectric materials. DFT and transport calculations were undertaken for this study. Ultrawide-band gap materials GaB_3N_4 and AlB_3N_4 are being studied in this work taking into account the elastic and inelastic scattering mechanisms for transport calculations. The utrahigh power factors are high (1821 $\mu Wm^{-1} K^{-2}$ in GaB_3N_4 and 1876 $\mu Wm^{-1} K^{-2}$ in AlB_3N_4 at 2000 K. The Seebeck coeffcients and electrical conductivities were used for obtaining the power factors. The ZT values obtained from calculation are considerable and can be used for high-temperature applications.





Biography

I have obtained my Doctoral Degree from Indian Institute of Technology Bombay (2000) and was working on dilated electron propagator to study electron scattering resonances. From 2000-2003, I was in US.A pursuing my Postdoctoral studies at Texas A&M University and University of Pittsburgh. At Texas A&M University, I was working on multiconfigurational spin tensor electron propagator method to calculate electron affinities and ionization energies. At University of Pittsburgh, I was working on calculating the binding energy of an excess electron interacting with polar molecules and their clusters. Currently I am a Professor in Chemistry at Vellore Institute of Technology, Chennai Campus, India, a Computational chemist, working in the area of and multiferroic and thermoelectric materials

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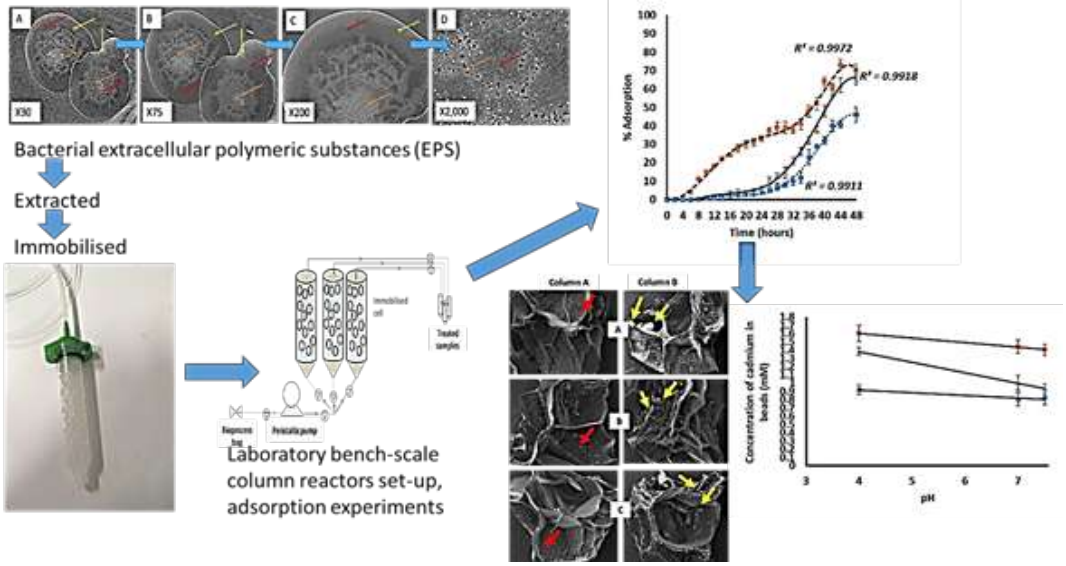
May 27-28, 2021

Biopolymer: Potential applications in bioremediation of cadmium contaminated waters

Nadia Mahmoud Tawfiq Jebril

University of Babylon, Iraq

Biopolymer nanotechnology, bacterial extracellular polymeric substances (EPS) has used markedly for various water treatment. EPS has polysaccharides, proteins, and lipids, which have functional groups such as amino, sulfhydryl, carboxylic, and phosphate groups thatallow binding to metal ions. The accumulation of the metal ions onto the EPS bacterial cell walls are used widely in the bioremediation of cadmium and other metals.The objectives of this study were the use of extracting EPSs from bacterium Bacillussubtilis 168 Cd2, and the investigation of their cadmium adsorption in bead column reactors after being immobilized with calcium alginate. For comparison with the role of the bacterium, B. subtilis 168 Cd2 was used before EPS extraction and immobilized with calcium alginate, as well as a comparison with the use of calcium alginate done.Cadmium adsorptions from solution onto calcium alginate beads with untreated Bacillussubtilis 168 Cd2, and EPS-free B. subtilis 168 Cd2, and under different pH (4.00, 7.00 and 7.50) were studied in this study. The percentages of adsorption onto untreated B. subtilis 168 Cd2, and EPS-free B. subtilis 168 Cd2 were determined and were 89% and 77%, respectively. The adsorption percentages of these were reduced when the pH increased. Scanning electron



microscopy (SEM) confirmed the changes in the morphology of the adsorbents and X-ray fluorescence (XRF) spectrometry analysis recorded the cumulative concentrations of cadmium in the adsorbents, after thecadmium adsorption process.The presence of EPS in untreated B. subtilis 168 Cd2 significantly enhanced cadmium adsorption percentages. The fewer carboxyl and phosphate groups in EPS-free B. subtilis 168 Cd2 were decreased cadmium adsorption. The results obtained in this study are of fundamental significance for applying the biopolymer nanotechnology environmental biotechnology, bioremediation.

Biography

Dr Nadia Jebril is an Associate Professor of Environmental Science, Department of Biology, and the College of Sciences for Women, University of Babylon, Iraq. She studied environmental sciences at Plymouth University, England, UK and received her PhD from Plymouth University in 2020. The main research interests of hers include application of environmental biotechnology to remediate waters.

Researcher | Environmental Biotechnology, Plymouth University, A403 Portland Square Building, Drake Circus, Plymouth, PL4 8AA, UK

Editor - American Journal of Environmental Protection (Science Publishing Group)

Editor -American Journal of Physics and Applications (Science Publishing Group)

Reviewer- RSC Advances, Royal Society of Chemistry

Member, Society for Applied Microbiology (SFAM), 2014 to date.

Member, Microbiology Society, 2014 to date.

Member, Iraqi Environment and Health Society, UK, 2017 to date.

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May 27-28, 2021

An investigation of structural deformation on elastomeric profiles during extrusion process using finite element analysis

Sujit Sharma[1], Arghya Deb[2] and **Santanu Chattopadhyay[1]**

[1]Rubber Technology Centre, Indian Institute of Technology Kharagpur, India
[2]Civil Engineering Department, Indian Institute of Technology Kharagpur, India

Extrusion is one of the most versatile and economical process for making long rubber profile for automotive, doors, windows, medical tubing and also some tire component etc. When rubber compound is forced through the extruder to get the desired shape of the product it deforms, which depends on the temperature, velocity, pressure and shear rate Thus, each new profile involves a new extrusion die, the key part of the extrusion process. The different parts of the dies are manually modified until the desired profile is obtained lacking the idea of the rheology of the material. The procedure usually extends over a dozens of times. In contrast to this approach, every changing conditions in the automotive field demand faster solutions to gain new customers while maintaining the existing ones. Rubber profiles manufacturers have to develop new profiles according to the necessities of the industry as soon as possible if they want to keep their current status. A higher degree of automatization may be really helpful in the development of the new dies. Here in this work we attempt to develop a possible strategy for simulating the flow within the die and predicting the required die shape in order to obtain a desired extrudate shape by using the proper rheological parameter and boundary conditions.

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May 27-28, 2021

Novel flame retardant polymer preparation using ring-opening olefin metathesis reactions

E. Kovács[1], F. Domahidy[1], A. Karayev[1], A. L. Tran[1] and B. Szolnoki[2]

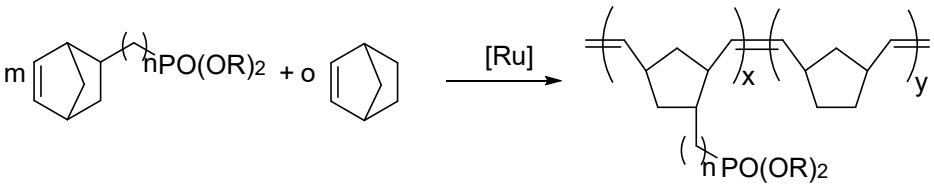
[1]Institute of Materials Science, Research Centre for Natural Sciences, Hungary
[2]Budapest University of Technology and Economics, Hungary

Flame retardant polymers belongs to the category of emerging materials as they could have significant impact on transportation, housing, construction, electricity, and packaging using wide scope of polymers like polyethylene, polyurethane, nylon, epoxy resin.

Since 1950, research on the ring opening metathesis polymerization has been also carried out and has led to several industrially relevant polymeric materials. Olefin metathesis polymerization-derived materials exhibit numerous advantageous properties and characteristics. The thermosetting poly(dicyclopentadiene) (PDCPD) seems likely to be able to break into the market by substituting to some extent epoxy-resins. PDCPD features favourable characteristics such as good chemical resistance, high heat distortion temperature and impact resistance. PDCPD and its copolymers are used to prepare body panels, competing with the traditional glass-reinforced plastic.

These polymers feature favourable characteristics for industrial applications; however, their thermal and fire resistance needs to be improved to meet the expectations of additional application areas. The substitution of some widely used halogenated flame retardant is required, since most of the monomers contain halogens that are nowadays used in the synthesis of these flame retardant polymers. However, there are restrictions in many global markets due to dioxins generation upon their combustion and facilitation of the headway of phosphorus flame retardants.

The goal of our project is the development of new, phosphonate-containing flame retardant monomers and polymers with fine tuneable phosphorus-content. The main advantage of the usage of phosphonate against also flame-retardant phosphate polymers is the improved resistance to moisture and thus extended lifetime of flame retardant properties. The copolymers will be synthetized via ring-opening metathesis polymerization (ROMP). It is expected that these polymers will exhibit an improved flame retardant performance meanwhile pose minimal adverse environmental impact. Using metathesis polymerization approaches not only linear phosphonate-containing polymers with well-defined alternating chemical structures can be synthetized but also highly cross-linked flame retardant frameworks with exceptional physical properties.



Biography

10.2019 – Research AssociatePolymer Chemistry Research Group, Research Center of Natural Sciences, Budapest, Hungary"Synthesis of new flame retardant polymers via olefin metathesis"

04.2019 – 10. 2019 Postdoctoral Research AssociateSchool of Chemistry, University of Manchester, United Kingdom"Development of new dual catalysis methods involving C-H activation and photo redox catalysis."

08.2016 – 03.2019 Postdoctoral researcherMetathesis Research Group, Research Center of Natural Sciences, Hungarian Academy of Sciences, Budapest, Hungary"Olefin Metathesis Assisted Synthesis of Biodegradable Polymers Using Algae Phospholipid Renewable Resources."

03.2017 – 05.2018 ResearcherFemtoincs Inc, Budapest, Hungary

07.2011 – 06.2017 Assistant research fellowMTA-BME Research Group for Organic Chemical Technology, Hungarian Academy of Sciences, Budapest, Hungary "Regio- and stereoselective reactions of polar organometallics"

09.2008 – 08.2012 PhD StudentDepartment of Organic Chemistry and Technology, Budapest University of Technology and Economics (BME), Budapest, HungarySupervisor: Prof. Dr. Ferenc Faigl

09.2003 – 06.2008 BSc and MSc StudentBachelor's and Master's Programme in Chemical Engineering, Faculty of Chemical Engineering, BME, Budapest, Hungary.

High performance polyester from biobased 1,6-Hexanediol and sulfur containing monomer

Wandji Djouoonkep Lesly Dasilva, Siegu William Mawuko Kodzo and **Songwe Naomie Selabi Beolle**

Wuhan University of Science and Technology, China

For applications such as food packaging or heat-resistant containers, bio-based copolyesters with a high glass transition temperature (Tg), good mechanical properties, and biodegradability are highly desirable. In this work, a series of 5 novel fully bio-based thiophenearomatic polyesters (TAP), including a heterocyclic-2,5-thiophene unit and an aromatic ring were successfully prepared from dimethyl 2,5-thiophenedicarboxylate (DMTD), dimethyl 2,5- dimethoxyterephthalate (DMDMT) and 1,6-hexanediol (HDO) via two-step meltpolymerization as a facile and green semi-continuous process. Characterization techniques used to monitor the melt polymerization process included FTIR, 1H NMR, GPC, DSC, TGA, and DMA analyses. The copolymers displayed tunable Tg values varying from 56-110 oC, while their GPC analysis showed high weight-average molecular weights (Mw) ranging from 38000 to 42500 g/mol and polydispersity indexes of 1.75-2.25. A systematic study of structureproperty relations revealed that the properties of these copolymers could be controlled by simply varying the composition ratio of the monomers. All the polyesters exhibited a high tensile strength (42-80 MPa) and good toughness (elongation at break of 200-550%). The degradation weight loss-reached up to 7.5% over a 28-weeks in soil hydrolysis in a humid environment, which is unexpected when considering the high Tg of the materials. Considering their excellent mechanical properties, chemical resistance, thermal stability and biodegradability, these sustainable copolymers appear to have good potential as substitutes for petrochemical-based poly(ethylene terephthalate).

Biography

Wandji Djouonkep L. D (1994-02-04), male, final year mater student at Wuhan University of science and Technology department of Chemistry and Chemical Engineering, Research field Fine Organic Chemical industry and New Organic materials.

PEERS ALLEY MEDIA

Theme: "Enlightening the Advancements in the fields of Polymer Science, Chemistry and Nanotechnology"

VIRTUAL EVENT

GLOBAL CONFERENCE ON ADVANCES IN POLYMER SCIENCE AND NANOTECHNOLOGY

May 27-28, 2021

Biomedical applications of polymer-coated metallic nanoparticles

C.M.Uritu[2] and **M.Pinteala**[1]

[1]*"PetruPoni" Institute of Macromolecular Chemistry, Romania*
[2]*"GrigoreT. Popa" University of Medicine and Pharmacy, Romania*

Metallic nanoparticles (NPs)are emerging as valuablediagnosis and therapeuticagents [1] with a particular interest in cancer therapy[2], although they demonstrated their potential in many other biomedical fields. The most studied metallic NPs are quantum dots, magnetic, silver, and gold NPs due to their unique physicochemical properties [3], high stability, versatility, and photothermal and plasmonic properties[4].One of the challenges is finding the optimal methods for synthesis and functionalization[5,6], obtaining colloidal solutions with a very narrow dimensional distribution of design NPs. This work aims to briefly describe the main synthesis pathways of gold/iron oxide NPs, as well as the strengths/weaknesses of these methods relating to their applicability in nanomedicine. The product consisting of PEGylatedAuNPs conjugated with TAT-peptide and doxorubicin (DOX) [7], proved a cytotoxic effect against osteosarcoma cells and is discussed hereinafter. The significant novelty of this

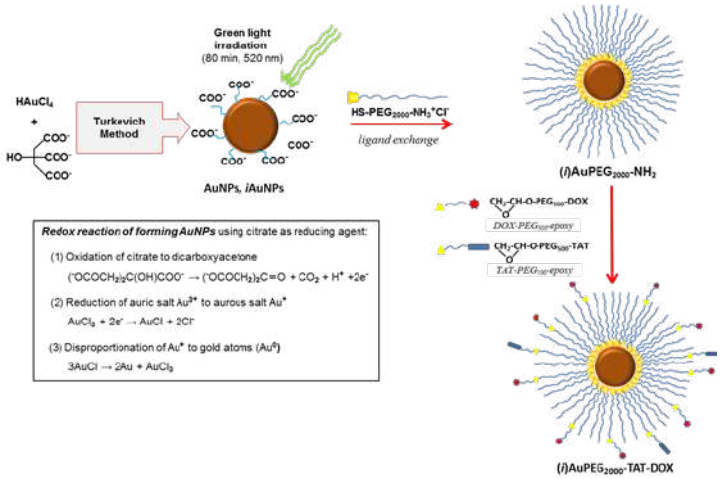


Figure 1. Overview on AuNPs synthesis, polymer coating, TAT-peptide functionalization, and conjugation with doxorubicin

product was the irradiation of AuNPs stabilized in sodium citrate, being exposed to green light (520 nm) prior to PEGylation (Figure 1). At this stage, the metal atoms were able to modify their oxidation state with an influence on organic layer conformation[8], which further induced remarkable stability of the finalproductand enhanced antitumor activity. The optical properties were analyzed by UV-vis spectroscopy, the surface modificationwas investigated using FTIR and XPS spectroscopy, and their size and morphologyby TEM and DLS. The conjugates containing DOX and TAT were characterized by fluorescence and FTIR. Theelectrochemical features were observed using cyclic voltammetry, suggesting better stability ofirradiated NPs. The cell viability assay showed that irradiated and non-irradiated nanoparticles coated withPEG are not toxic in normal cells, while thosemodified with DOX and TAT were more effective than pristine DOX on tumor cells, indicating cytotoxicity upto 10% higher than non-irradiated ones

Biography

Dr. Mariana PINTEALA is a senior researcher and head of the IntelCentru department,with expertise in the synthesis of nanoconjugatesfor biomedical application (core: Fullerene C60, cyclodextrins, magnetite, gold, cerium oxide), inclusion complexes of cyclodextrins/modified cyclodextrins with different bioactive molecules; pseudo- and polyrotaxanesof cyclodextrins with (co)polymers; synthesis and characterization of polymers and copolymers; cationic, anionic, and radical copolymerization; Structure-property relationship evaluation, data analysis, and interpretation; interpolymer complexes; purification and analysis of antibiotics; ESR spectroscopy. She has abilities to initiate and conduct research projects either independently or as a team member, of making decisions at the administrative level, work on international grants and industrial projects with researcher teams from diverse countries; adaptive to new research environments and circumstances.

Dr. Cristina M. URITU holds a degree in Medical Bioengineering and Chemical Engineering and a Ph.D. in chemistry. She currently works as a research scientistin nuclear medicine imaging, PET-MRI lab supervisor. Knowledge of PET-MRI technique for in vivo molecular and preclinical imaging; design and synthesis of nanostructures for gene and drug release; characterization of chemical compounds: IR, NMR, UV-Vis, fluorescence, gel electrophoresis, HPLC, DLS. She has reach experience asa team member in numerous national and international,past or ongoing projects.

PEERS ALLEY MEDIA

Theme: "Enlightening the Advancements in the fields of Polymer Science, Chemistry and Nanotechnology"

VIRTUAL EVENT

GLOBAL CONFERENCE ON ADVANCES IN POLYMER SCIENCE AND NANOTECHNOLOGY

May 27-28, 2021

Silicone breast implants: Grafting of a bioactive polymer to improve the bio-integration

M.Lam, V. Moris, V. Migonney and **C. Falentin-Daudré**

Institut Galilée, Université Sorbonne Paris Nord, France

Lately, breast implants' emergence associated with anaplasic large cell lymphoma (BIAALCL) has led to the reconsideration of breast implants' safety. The lymphoma is characterized by a hardener capsular contracture causing pathological fibrosis and skin deformations leading to the removal of the implant. The origins of BIA-ALCL remain unknown, but bacterial infections appear as the main explanation. The surface's nonwettability contributes to poor cell adhesion and non-specific plasmatic protein adsorption, which is favorable to bacterial proliferation in fine. Numerous strategies have been employed to avoid bacterial contamination by modifying silicone surfaces through prevention, repelling, or killing actions with either covalent grafting or coatings (1) . Besides, methyl groups' presence on silicone (poly(dimethylsiloxane) siloxane's backbone makes the surface chemical modifications challenging. Among these methods, our team has recently developed a simple way to graft hydrophilic and bioactive polymer bearing sulfonate groups (sodium polystyrene sulfonate) - polyNaSS) on silicone surfaces only by using UV (2) . The mechanism (Figure 1) is based on a grafting "from" method: the surface is first activated to create reactive polar groups on it. Under UV irradiations, oxygen radical species are generated, allowing the initiation of the radical polymerization. Characterization of the grafting was done using colorimetric analysis, water contact angle measurements (WCA), X-ray photoelectron spectroscopy (XPS), scanning electron microscope (SEM),

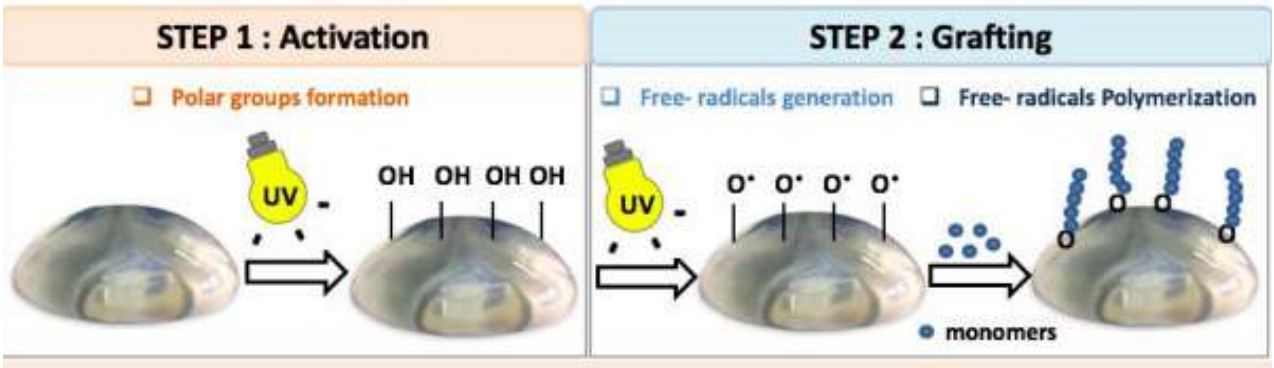


Figure 1: Grafting mechanism of polyNaSS on silicone surface

Fourier-transform infrared spectroscopy (ATR-FTIR), and atomic force microscopy (AFM). Biologically, the polymer has already shown anti-bacterial properties (anti-adhesive action) combined with a good biointegration on other surfaces (3) . The same studies are currently under investigation on breast implant surfaces, and recent results are encouraging.

Biography

Mylan LAM is currently a third-year Ph.D. student in the field of biomaterial chemistry. She works on the functionalization of breast silicone implants with bioactive polymers to improve their biocompatibility. She carries her research in the Laboratory of biomaterials for health at the Sorbonne Paris Nord University. In 2018, she was graduated with a Master degree in materials chemistry from Sorbonne University.

PEERS ALLEY MEDIA

Theme: "Enlightening the Advancements in the fields of Polymer Science, Chemistry and Nanotechnology"

VIRTUAL EVENT

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May 27-28, 2021

The aging behavior of two commercial conductive POLYTHIOETHER SEALANTS

S. Bafna

Raytheon Technologies, USA

Conductive polythioethers are widely used sealants where both environmental and electromagnetic radiation sealing is required. The aging behavior of these sealants is of critical interest in industry since hardware built using these sealants may need to function satisfactorily and the sealant provide a satisfactory seal for years, if not decades, after the hardware is initially built and the sealant initially applied. Accelerated oven aging data at 65, 75 and 85C for time periods ranging from 73-1773 hours on two commercial conductive polythioether sealants are discussed. Adhesion efficacy is quantified by changes in lap shear per ASTM D1002. Electromagnetic interference sealing efficacy is quantified by changes in volume resistivity per MIL-STD-883. The two sealants show similar aging behavior for conductivity in that volume resistivity fell dramatically upon accelerated oven aging. The lap shear increased significantly for only one of the two sealants, indicating that the supplier recommended cure protocol for that sealant did not lead to full cure. Instead, the cure progressed further during accelerated oven aging. This caused the lap shear to increase up to around 40% as compared to unaged samples. The aging temperature was limited to 85C out of concern that a higher temperature may change the

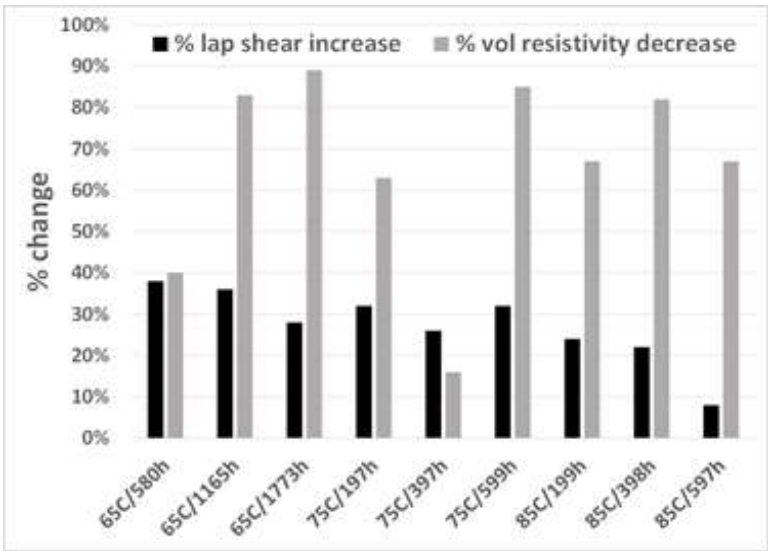

Fig-1: *Percent lap shear increase and percent volume resistivity decrease after accelerated oven aging of Sealant-1*

degradation mechanism from that prevailing at Room Temperature, RT [23C], which can lead to erroneously high life predictions. The aging time was limited to 1773 hours [74 days] due to practical, equipment and experimental constraints. It is expected that the adhesive and conductive efficacy after 30 years at 23C should be no worse [and perhaps significantly better] than upon initial build.

Aging Temperature	Hours of Exposure	Failure mode	lap shear, MPa	% lap shear change	COV = sd/average
Supplier Data sheet			0.45 min		
Control		Cohesive	1.49+/-0.06		4%
65C	581	Cohesive	1.50+/-0.08	1%	5%
65C	1159	Cohesive	1.56+/-0.10	5%	7%
65C	1752	Mixed	1.59+/-0.06	6%	3%
75C	239	Cohesive	1.50+/-0.14	0%	10%
75C	397	Adhesive	1.57+/-0.20	6%	13%
75C	600	Cohesive	1.31+/-0.06	-12%	4%
85C	73	Cohesive	1.75+/-0.03	18%	2%
85C	144	Cohesive	1.39+/-0.04	-6%	3%
85C	239	Cohesive	1.32+/-0.02	-11%	2%

Table-2: *Change in lap shear due to accelerated oven aging of Sealant-2*

Biography

Sudhir Bafna is a Senior Principal Multi-Disciplined Engineer at the Missiles and Defense Division of Raytheon Technologies in Tucson, Arizona, USA. He has been the subject matter expert in elastomers, plastics and adhesives/ sealants at Raytheon since 2008. Before that, he was a product development and process engineer at Solvay Engineered Polymers in Mansfield, Texas, USA working on compounded TPO and TPE for automotive industry. He has a PhD in Chemical Engineering from the University of Massachusetts at Amherst. He has 20 publications in peer-reviewed journals and 22 presentations at conferences.

PEERS ALLEY MEDIA

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VIRTUAL EVENT

GLOBAL CONFERENCE ON ADVANCES IN POLYMER SCIENCE AND NANOTECHNOLOGY

May 27-28, 2021

Modulation of tubulin polymerization into microtubules for optimized outcome in cancer nanomedicine

Devika B Chithrani[1,2,3,4], Aaron Bannister[1], Kyle Bromma[1], Abdulaziz Alhussan[1], Ece Pinar Demirci Bozdoğan[1] and Wayne Beckham[2]

[1]University of Victoria, Canada
[2]BC Cancer, Canada
[3]University of Victoria, Canada
[4]University of British Columbia, Canada

INTRODUCTION: One of the major issues in current radiotherapy (RT) is the normal tissue toxicity. A smart combination of agents within the tumor would allow lowering the RT dose required while minimizing the damage to healthy tissue surrounding the tumor(Fig. 1a).[1] We chose gold nanoparticles (GNPs) and docetaxel (DTX) as our choice of two radiosensitizing agents. GNP targets DNA while DTX target microtubule structure affecting cell division (Fig. 1b). We assessed the variation in GNP uptake, distribution in the presence of DTX and resulting therapeutic effectsof the triple combination, RT/GNPs/DTX (Fig. 1c-e).[1, 2]

METHODS: We used HeLa and MDA-MB-231 cells for our study. Cells were incubated with GNPs (0.2nM) in the absence and presence of DTX (50nM) for 24 hrs for determination of uptake, distribution, and retention of NPs. For

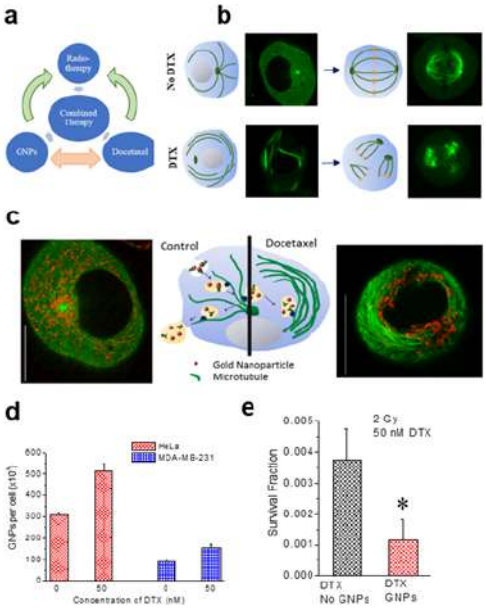

***Figure 1**. Modulation of microtubule network for optimized outcome in cancer nanomedicine. a) Combination of gold nanoparticles (GNPs) and microtubule stabilizing agent, docetaxel (DTX) for optimizing radiotherapy. b) Effect of DTX on cell division. c) Change in GNP distribution in the presence of DTX. d) DTX-modulated NP uptake. e) Synergistic therapeutic results with the combination of GNPs and DTX with RT.*

RT experiment, treated cells were given a 2 Gy dose of 6 MV photons using a linear accelerator.

RESULTS: The presence of DTX redistributed GNPs closer to the nucleus (Fig. 1c) making it more desirable for RT. Concurrent treatment of DTX and GNPs resulted in an increase in uptake and retention of GNPs in tumor cells (Fig. 1d). DTX treatment also forced GNPs to be closer to the most important target, the nucleus, resulting in a significant decrease in cell survival with the triple combination of RT, GNPs, and DTX vs. RT plus DTX alone (Fig. 1e).

CONCLUSION: The ability to not only trap GNPs at clinically feasible doses but also to retain them within the cells could lead to meaningful fractionated treatments in future combined cancer therapy. Furthermore, the suggested triple combination of RT/GNPs/DTX may allow lowering the RT dose to spare surrounding healthy tissue.[3]

ADVANCES IN KNOWLEDGE: This is the first study to show intracellular GNP transport disruption by DTX, and its advantage in radiosensitization.[4].

Biography

Dr.Chithrani is an associate professor at University of Victoria and also the director of the Nanoscience and Technology Development Laboratory. She leverages nanotechnology to create innovations that advance the care of cancer patients. She is using gold nanoparticles as a radiation dose enhancer in cancer therapy. This work is featured on the cover of radiation research journal and was also awarded the Michael S. Patterson publication prize in 2018. She has developed three dimensional tumor models to optimize Bio-Nano interface in cancer therapy. This work is featured two times on the cover of Nano-Micro Letters journal. She is considered as one of the leaders in the field of nanotechnology and her publications have received close to 10,000 citations in few years. Dr.Chithrani has earned a strong international reputation for her innovative research through her many review articles, book chapters, and invited presentations. Her passion is to develop smart nanomaterials to improve current cancer therapeutics.

PEERS ALLEY MEDIA

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VIRTUAL EVENT

GLOBAL CONFERENCE ON ADVANCES IN POLYMER SCIENCE AND NANOTECHNOLOGY

May 27-28, 2021

Scalable production of polyhydroxybutyrate biopolymer from Cupriavidus necatorATCC 17697

D. Nygaard

Escuela de Ciencia y Tecnología, Universidad de San Martín, Argentina

Polyhydroxyalkanoates (PHAs) are polymers with increasing commercialization due to the excellent combination of their attributes: thermoplastic, biodegradable and biocompatible. Native Cupriavidus necator is a model tool for the biotechnological production of PHAs.

In this work, we studied the accumulation of PHAs from the native strain C. necator ATCC 17697 to generate PHAs at a laboratory scale and establish the parameters of the process that allow productive scaling. The culture medium containing fructose as the sole carbon source was optimized for the production of PHA by statistical design of experiments in Erlenmeyer. The production process was scaled and optimized in a 7 l bioreactor. In the batch and fed-batch mode, different strategies of fermentation were analyzed. Also, alternative carbon sources were evaluated for the production of PHAs by the bacteria. Finally, physico-chemical characterization of the polymers produced was carried out and membranes were made to evaluate their possible use as a biomedical material.

During the optimization of the culture medium in Erlenmeyer, it was possible to increase the production of PHB by 2.5 times, compared to the initial experiments. By scaling and optimizing the bioreactor process, the production of PHA increased 5 times more, finally achieving 27 g/l of PHA in the fermenter, with a maximum volumetric productivity of 0.43 g/(l.h). Of the industrial waste used as alternative carbon sources for the production of PHAs by C. necator ATCC 17697, residual glycerol and sugarcane molasses proved to be more promising.

The PHA produced, extracted, purified, and characterized was useful for the production of membranes that were not cytotoxic and whose mechanical properties were comparable with those of biomedical membranes developed by our team. These results encourage to consideration of the biomaterial produced in this investigation for biomedical applications.

Biography

Daiana Nygaard is a Biotechnologist with and Ph.D. in Applied and Engineering Sciences. She is an expert in microbial fermentation optimization by design of statistical experiments and fermentation strategies in a bioreactor; production of different types of bacterial polyhydroxyalkanoates (PHAs) from analytical grade carbon sources and agro-industrial wastes; purification and characterization of polymers.

PEERS ALLEY MEDIA

Theme: "Enlightening the Advancements in the fields of Polymer Science, Chemistry and Nanotechnology"

VIRTUAL EVENT

GLOBAL CONFERENCE ON ADVANCES IN POLYMER SCIENCE AND NANOTECHNOLOGY

May 27-28, 2021

Synthesis of ion exchange membrane by electrospinning technique - Effect of the process parameters on the membrane properties

J. Jaime-Ferrer and **L. Villafaña-López**

CIATEC A.C., México

Salinity gradient energy has gained popularity in recent years as an environmentally friendly renewable energy source. This type of energy is generated by mixing oceanic salt water with fresh river water through a reverse electrodialysis (RED) system. This system is comprised of several cation- (CEMs) and anion-exchange membranes (AEMs) that are selective to cations and anions in solution. These ion-exchange membranes (IEMs) must have a low degree of swelling, a low electrical resistance, and a high degree of permselectivity in order to be effective for RED [1]. Electrospinning is a technique for synthesizing membranes from nanofibers; previous works [2,3] have demonstrated that the membrane properties can be improved using this technique due to the increased ion-exchange capacity and decreased swelling degree. The present work studies the influence of various electrospinning parameters, such as voltage, tip-to-collector distance, polymer flow velocity, humidity, and collector rotation speed, on the membrane properties.

The IEMs synthesis was carried out using an Inovenso Ne100 Nanospinner semi-professional electrospinning machine. For the preparation of the AEM, polyepichlorohydrin, polyacrylonitrile, and 1,4-Diazabicyclo[2.2.2]

Anion Exchange Membrane (AEM)

Parameter	*Value*	*Thickness*	*Swelling degree*	*Ion exchange capacity*	*Fixed charge density*	*Permselectivity*	*Electrical Resistance*	*Conclusions*
		μm ± SE	% ± SE	meq/g ± SE	meq/g ± SE	% ± SE	Ω·cm^2 ± SE	
Flow velocity	**0.225 ml/h**	**57.1 ± 0.2**	**4.36 ± 0.24**	**3.66 ± 0.11**	**83.94 ± 0.29**	**90 ± 0.02**	**1.3 ± 0.2**	Low flow velocities increase the permselectivity and electrical resistance of the membranes.
	0.325 ml/h	42.9 ± 0.1	4.53 ± 0.11	3.95 ± 0.02	87.19 ± 0.09	87 ± 1.3	1.9 ± 0.3	
	0.525 ml/h	64.3 ± 0.4	10.77 ± 0.04	4.33 ± 0.2	40.22 ± 0.16	85 ± 0.4	2.2 ± 0.02	
Humidity	60%	57.1 ± 0.2	4.36 ± 0.24	3.66 ± 0.11	83.94 ± 0.29	90 ± 0.02	1.3 ± 0.2	**No significant impact of the humidity was observed on the properties of the membranes.**
	80%	54.3 ± 0.2	4.41 ± 0.03	4.39 ± 0.4	99.54 ± 0.35	89.2 ± 0.01	1.4 ± 0.04	
Collector speed	100 rpm	57.1 ± 0.2	4.36 ± 0.24	3.66 ± 0.11	83.94 ± 0.29	90 ± 0.02	1.3 ± 0.2	The collector speed influences the distribution of the fibers of the membranes.
	300 rpm	**41.4 ± 0.5**	**0.92 ± 0.21**	**8.69 ± 1.3**	**944 ± 0.3**	**93 ± 0.04**	**0.9 ± 0.1**	
	500 rpm	51.4 ± 0.2	1.38 ± 0.37	5.29 ± 0.9	383 ± 0.64	91 ± 0.05	1.1 ± 0.3	
Pretreatment	Without reflux distillation	61.4 ± 0.3	3.43 ± 0.07	2.70 ± 0.03	78.71 ± 0.13	87 ± 0.03	3.5 ± 0.02	Reflux distillation is necessary to obtain better membrane properties.
	With reflux distillation	**57.1 ± 0.2**	**4.36 ± 0.24**	**3.66 ± 0.11**	**83.94 ± 0.29**	**90 ± 0.02**	**1.3 ± 0.2**	
Thickness	**< 100 μm**	**57.1 ± 0.2**	**4.36 ± 0.24**	**3.66 ± 0.11**	**83.94 ± 0.29**	**90 ± 0.02**	**1.3 ± 0.2**	Improved membrane properties are observed when the thickness is below 100 μm.
	> 100 μm	122 ± 0.4	12.36 ± 2.2	11.00 ± 2.1	88.99 ± 0.03	88 ± 0.1	2.5 ± 0.5	

octane were used. For the preparation of the CEM, polyvinyl chloride, tetrahydrofuran anhydrous, and a cation exchange resin were used. The synthesized IEMs were characterized by their thickness, swelling degree, ion-exchange capacity, fixed charge density, permselectivity, and electrical resistance. It was detected that low humidity conditions (<60%) improved the synthesis process by promoting solvent evaporation and the formation of defect-free fibers. A high collector rotational velocity (>300 rpm) allowed for a better distribution of the fibers and thus a more uniform final membrane. A membrane thickness below 100 µm also presented improved properties over thicker samples. Lastly, the flow velocity and voltage should be maintained relatively low in order to minimize the presence of defects in the fibers. As a general conclusion, it can be said that the electrospinning technique is very promising for the synthesis of ion exchange membranes giving them satisfactory characteristics for their operation.

Table. Influence of the different experimental parameters on the properties of AEMs and CEMs. All experiments were performed in triplicate and their average value with standard error (SE) are shown. The best results for each parameter studied are in bold text

Cation Exchange Membrane (CEM)								
Parameter	*Value*	*Thickness*	*Swelling degree*	*Ion exchange capacity*	*Fixed charge density*	*Permselectivity*	*Electrical Resistance*	*Conclusions*
		µm ± SE	% ± SE	meq/g ± SE	meq/g ± SE	% ± SE	Ω·cm² ± SE	
Flow velocity	0.050 ml/h	66.1 ± 0.2	1.64 ± 0.65	0.9 ± 0.34	54.87 ± 0.29	85 ± 0.09	3.5 ± 0.1	Flow velocity has a big impact on the membrane properties.
	0.100 ml/h	**72.1 ± 0.03**	**1.5 ± 0.01**	**1.6 ± 0.08**	**106.66 ± 0.09**	**91 ± 0.03**	**2.9 ± 0.3**	
	0.200 ml/h	74.5 ± 0.06	5.43± 0.1	1.5 ± 0.2	27.62 ± 0.16	79 ± 0.4	6.2 ± 0.02	
Humidity	**40%**	**82.3 ± 0.1**	**1.2 ± 0.09**	**1.64 ± 0.03**	**136.66 ± 0.06**	**92 ± 0.1**	**2.85 ± 0.1**	Low humidity improves the ion exchange membranes properties.
	60%	72.1 ± 0.03	1.5 ± 0.01	1.6 ± 0.08	106.66 ± 0.09	91 ± 0.03	2.9 ± 0.3	
	80%	70.3 ± 0.3	10.33 ± 3.1	0.2 ± 0.01	1.93 ± 0.9	74 ± 0.5	10.22 ± 1.3	
Collector speed	100 rpm	65 ± 0.1	2.7 ± 0.3	1.55 ± 0.3	57.40 ± 0.1	89 ± 1	4.2 ± 0.2	The collector speed has no observable influence on the membrane properties.
	300 rpm	**72.1 ± 0.03**	**1.5 ± 0.01**	**1.6 ± 0.08**	**106.66 ± 0.09**	**91 ± 0.03**	**2.9 ± 0.3**	
	500 rpm	66 ± 0.05	2.45 ± 0.1	1.52 ± 0.2	62.04 ± 0.1	88 ± 2	5.3 ± 0.01	
Voltage	12kV	77.2 ± 0.9	1.56 ±0.3	1.57 ± 0.1	100.64 ± 0.2	90 ±1	3.2 ± 0.02	The voltage has no observable influence on the membrane properties.
	17kV	**72.1 ± 0.03**	**1.5 ± 0.01**	**1.6 ± 0.08**	**106.66 ± 0.09**	**91 ± 0.03**	**2.9 ± 0.3**	
	20 kV	68.9 ± 0.1	1.53 ±0.09	1.62 ±0.01	105.88 ± 0.08	90±0.3	4.5 ±1	
Thickness	**< 100 µm**	**72.1 ± 0.03**	**1.5 ± 0.01**	**1.6 ± 0.08**	**106.66 ± 0.09**	**91 ± 0.03**	**2.9 ± 0.3**	Improved membrane properties are observed when the thickness is below 100 µm.
	> 100 µm	123.4 ± 0.3	20.5 ± 2.1	1.54 ± 0.09	7.51 ± 1.9	90 ± 0.2	5.43 ± 0.2	

Biography

Dr Jaime-Ferrer obtained a phDdegree in ProcessEnginneringand specialized inelectromembraneprocessesat EcoleCentrale Paris in 2008.From2009 to 2017hewascoordinatedtheelectrodepositionresearchin twofrenchenergystart-ups. He has authored9 International Patents, around28publications in ScientificJournals (ISI). Dr. Jaime-Ferrer iscurrently a resercher at CIATEC thatitispart of thenetwork of public centersof themexicancouncil of science and technology. Hisresearchworkismainly in thefields of new materialsforenergyconversion and storage..

PEERS ALLEY MEDIA

Theme: "Enlightening the Advancements in the fields of Polymer Science, Chemistry and Nanotechnology"

VIRTUAL EVENT

GLOBAL CONFERENCE ON ADVANCES IN POLYMER SCIENCE AND NANOTECHNOLOGY

May 27-28, 2021

Grafting of poly(*N*-vinylimidazole) and quaternized poly(*N*-vinylimidazole) onto cotton gauzes and its evaluation of antibacterial and pH-buffering medical devices

L.A. Camacho-Cruz, M.A. Velazco-Medel and **Emilio Bucio**

Universidad Nacional Autónoma de México, Ciudad Universitaria CDMX, México

The variety and resourcefulness of medical devices has allowed for a substantial improvement of medical care in recent years. Through more versatile systems, materials with new functions have been produce with the objective to fulfill specific necessities of the medical field. Cotton gauzes are devices which are virtually mandatory in any medical application, and thus, the sought for functional cotton gauzes has increased over the years.

Cotton gauzes are already intrinsically useful because they are an effective physical protection for wounds and they also can easily absorb bodily fluids in chirurgical procedures. Even with these advantages, cotton gauzes cannot stop bacteria from forming biofilms within the gauze and then infecting the dressed wound. Currently, the most effective strategy to deal with bacterial infections when using gauzes is the use of a prophylactic treatment of antibiotics. This strategy is effective, but it considerably increases the cost of the treatment and increases the risk of the formation of antibiotic resistant bacteria. Having this in mind, this project explored the possibility of including an antibacterial substrate covalently bound to a cotton gauze.

To fulfill the project's objective, the grafting of poly(N-vinylimidazole) and its quaternized counterpart was performed using a radiation induced polymerization, and the performance of the final material as an antibacterial medical device was evaluated. After confirming the graft of the functional polymers by spectroscopic techniques.

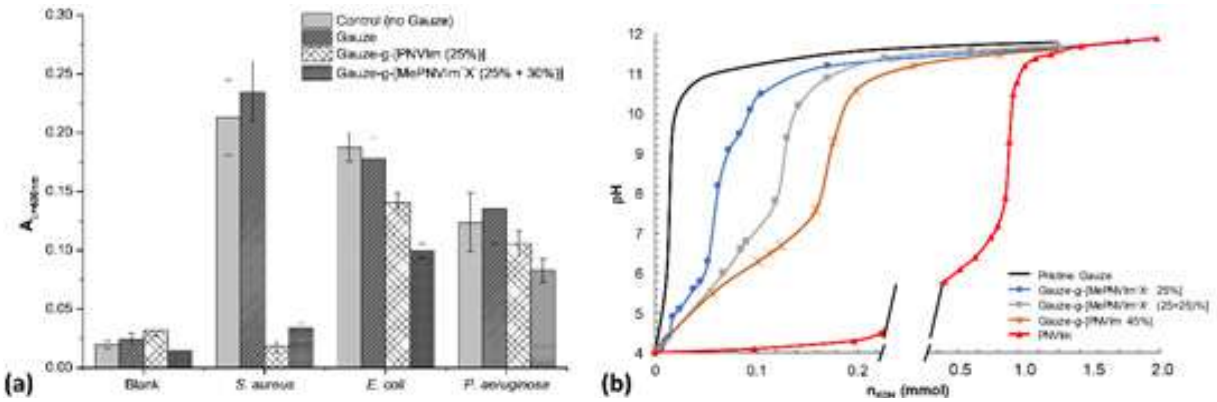

Figure 1. (a) Bacterial growth inhibition caused by functionalized cotton gauzes, **(b)** pH titrations depicting pH buffer capabilities of the material

The results showed that the grafted cotton gauzes effectively prevent the growth of S. aureus, E. coli and P. aeruginosa(Figure 1a). Besides, the cotton gauzes were shown to function as excellent pH buffer with an average conditional acidity constant of approximately pKa=5.6 (Figure 1b) which is compatible with the pH of human skin (and healthy wounds) which is slightly acidic.

Biography

Luis Camacho is a Grad Student which recently obtained his M. Sc. In the National Autonomous University of Mexico and it is pursuing his PhD. He has experience with both electrochemical systems and polymer chemistry which has allowed him to develop new systems with new functions for the medical field. Currently, he is working with click chemistry and polymer systems, also pursuing the development of polymeric sensors.

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GLOBAL CONFERENCE ON ADVANCES IN POLYMER SCIENCE AND NANOTECHNOLOGY

May 27-28, 2021

Rheological impact and economic implications of partial to total substitution of imported bentonite clay for oil and gas drilling operations in Nigeria

Oghenerume Ogolo[1], Akeem Arinkoola[1,2], Samuel Osisanya[1,3], Frank Egede[4], Joseph Choir[5] and **Abraham Ebunu[6]**

[1]African University of Science and Technology, Nigeria
[2]LadokeAkintola University of Technology, Nigeria
[3]Khalifa University of Science and Technology, UAE
[4]Petroleum Training Institute, Effurun, Nigeria
[5]Nile University of Nigeria, Nigeria
[6]African University of Science and Technology, Nigeria

In less than a decade, there have been 2 global melt down of crude oil price and the latest was caused by the spread of coronavirus disease (COVID-19) in 2020. This is expected to have a negative impact on the global economy especially on those country that depends more on the revenue from sales of crude oil. One of the measures that can be taken to survive this kind of situation in the future is to reduce the unit technical cost for producing a barrel of oil by using locally available materials. This research investigated a local clay sourced from Ropp in Plateau State, Nigeria by considering its rheological characteristics and economic implications of using it for partial to total substitution of imported bentonite clay for oil and gas drilling operations. The local clay was termed as Ropp bentonite clay (RBC). Various spud mud samples were prepared by dispersing a mixture of imported bentonite clay (IBC) and RBC (0-100%) in 350 ml of water. It was observed that the clay blend did not yield a mud viscosity up to API standard. Certain quantity (0-1 g) of polyacrylamide cellulose was added to the mud samples to beneficiate it. An economic model was built to determine the cost implications of using any of the mud formulation at different consumption rate. The results show that IBC-RBC blend in the right proportion could save Nigeria 12 to 36% of the cost of bentonite clay used to drill wells in the country

Biography

Oghenerume is a lecturer at Nile University of Nigeria and a doctoral student at the African University of Science and Technology (AUST). He has both industry and academia experience. His research interest include: drilling fluid, enhanced oil recovery and petroleum economics. He is currently developing a novel method for the use of polymers for drilling fluid applications. He has made some remarkable achievements in the area of drilling fluid. He developed a novel method for the improvement of the rheological properties of low swelling bentonite clay. He has also developed an economic framework for partial to total substitution of imported bentonite clay in Nigeria. He has 13 publications in Scopus. He holds a BEng in Petroleum Engineering from the University of Benin and an MSc in Petroleum Engineering with Distinction from AUST. Oghenerume is a member of the Society of Petroleum Engineers and African Materials Research Institute.

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May 27-28, 2021

Design and implementation of a crossflow turbine for PICO hydropower electricity generation

O.C.Okafor, C.H.Achebe, and E.N.Obika

Nnamdi Azikiwe University, Nigeria

This study covered the design, implementation and performance evaluation of a crossflow turbine at various positions of the nozzle. The blade material was selected on the basis of high strength and minimum cost with the aid of Granta material selector software using the relevant performance indices required. The chosen material was further analyzed with ANSYS for stress and deformation degree under the impact of hydraulic jets to ascertain its suitability while in operation. The shaft which carries the runner assembly, flywheel for torque multiplication and energy storage, pulleys and the load-carrying bearings was analyzed under static and dynamic conditions using ANSYS in order to ensure a non-plastic deformation of the shaft at both conditions. The turbine was constructed using the design values obtained. An experiment was designed for the evaluation of the crossflow turbine performance using optimal (custom) design tool of response surface methodology and 69 simulations/runs were obtained. The factors considered in the experimental design are: nozzle distance from the shaft, nozzle height and attack angle. The turbine was tested under a water head and flow rate of 6.4m and 0.0042m^3/s respectively. A digital tachometer was used to measure the revolution per minute (RPM) of the runner shaft at each of the nozzle positions. The turbine's shaft power and efficiency were equally computed using their respective formulas. The responses were optimized in order to get the optimum position of the nozzle that would give the best performance of the responses using the two-factor interaction (2F1) mathematical models in coded factors developed for each of the response. The results obtained, proved that low carbon steel material was suitable for the turbine blading and the shaft is safe at both static and dynamic conditions since the induced stresses and deformations never exceeded the permissible range. Also, each of these considered nozzle positional factors has a significant effect on the responses with the nozzle height and attack angle having a combined effect on the turbine's performance. The crossflow turbine performed to higher response values at lower angle of attack, nozzle distance very close to the runner shaft and at a nozzle height that will actualize greater energy impartation to the upper and lower blade profiles. The developed mathematical models for each response has higher correlation value, attesting to the model's suitability for response prediction at any factor level considered. The optimal nozzle distance, height and attack angle were gotten to be 102mm, 413mm and 5° respectively.

Biography

Engr. Obiora C. Okafor is a research and development driven fellow. Innovative concepts and its ergonomic contributions to the global world are the key tools I adhere to inquest of advancing the frontiers of engineering on the global space. I'm an academic lecturer at Grundtvig Polytechnic, Oba, Nigeria. Scientech Academy where research and development are carried out was founded by me. The academy was developed on the basis of the drive to make a substancial contribution in the field of research to the global space. I had eight distinctions in the West Africa Senior School Certificate Examination and that marked the end of my secondary education. I graduated with a first class honours degree in both the bachelor and masters of engineering programmes at Anambra State University, Nigeria and Nnamdi Azikiwe University, Nigeria respectively. I received the awards of the best graduating student of Mechanical Engineering and the entire Faculty of Engineering, Anambra State University, Nigeria. I'm also a recipient of various scholarship awards from different organizations. I have contributedsix (6) research papers in the fields of: hydropower, combustion phenomenon, statistical thermodynamics and strength assurance of welded structures. My central research focus is on energy and thermo fluid science. Aside from academic interest, I'm a lover of: making new friends, football and music.

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May 27-28, 2021

Synthesis of Temperature and pH-Sensitive Polymers based on 2-Oxazolines and N-Isopropylacrylamide

Juan Carlos Rueda S.

ResearchDepartment(DGI), Pontifical Catholic University of Peru (PUCP), Peru.

Thermally sensitive polymers have been synthesized and produced by a combination of the cationic ring-opening polymerization of 2-oxazolines and the free radical polymerization of N-isopropylacrylamide (NiPAAm). The polymers made had various polymeric structures such as block copolymers, graft copolymers and hydrogels. In some cases the thermal sensitivity was provided by the NiPAAm segments and in other cases this sensitivity was obtained by the poly(2-oxazolines) segments. The polymers were characterized by NMR, FTIR and GPC and the conformational transition (LCST or T_{tr}) of the polymers was determined by NMR, turbidity and DSC measurements. The transition temperature of the polymers could be adjusted by balancing their composition (hydrophilic and hydrophobic elements) and their macromolecular structure. An increasing amount of hydrophobic elements in the polymer decreased the value of the conformational transition while a greater hydrophilicity the value of LCST increased.

In some cases pH sensitivity was also obtained when elements such as carboxylic acid groups were introduced into the polymer structure.

The water-soluble polymers showed the formation of micelles or macromolecular aggregates in water, which in some cases could give rise to the formation of polymeric nanogels, pH- and thermosensitive, by means of irradiation with electron rays.

Biography

Principal professor of the Department of Sciences at the Pontifical Catholic University of Peru (PUCP), Specialist in the field of polymers, with 15 research stays in Germany from 1994 to 2020, which were carried out at the Leibniz Institute for Polymer Research in Dresden (IPF) and at the Technological University of Munich (TUM) and Fellow of the German Academic Exchange Service (DAAD) and the Leibniz Institute for Polymer Research in Dresden, Germany.

Prof. Rueda is a chemical engineer by profession, master's degree and doctor of chemical sciences. Prof. Rueda has been six time a visiting professor at the Technological University of Ilmenau, Germany and at the University of Santiago de Compostela, Spain.

He is the author of more 30 international publications in the field of polymers in specialized polymer journals in the United States, England and Germany and also is author of an invention patent at the United States Patent Office.

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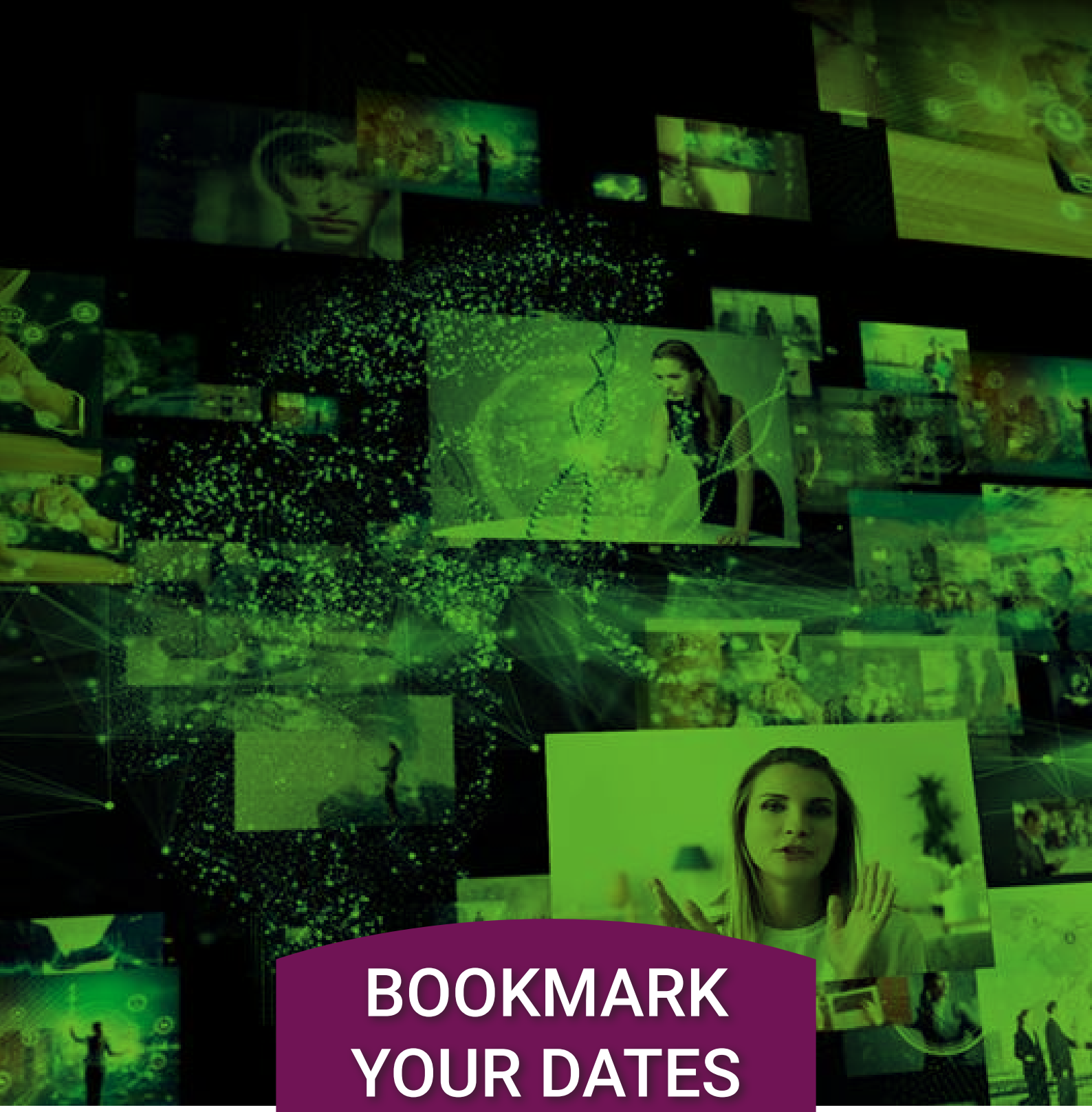
INDEX



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