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Enhanced UV Absorption and Low Energy Gap of Polymer Doped ZrO_2-SiC NPs

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Abstract. In present work, the structure, absorption and energy gap of films prepared from biodegradable polymer doped ZrO_2-SiC NPs for UV-shielding, biomedical fields and optoelectronics approaches were investigated. The nanocomposites films were fabricated by casting method. The absorption spectra was measured in range (200-800) nm. Results indicated to enhance in absorption and energy gap of biopolymer by adding of ZrO_2-SiC NPs ratios, this behavior make it suitable for various applications like antibacterial films, anti-UV light, diodes, solar cell, transistors and other fields.

1. Introduction

The nanotechnology is a mainly special approach, ranging from new expansions of typical physics of device to accurately novel fields to improving novel materials have sizes on the nanometer scale. Polymers have stability after chemical and physical doping with high mechanical properties [1]. Various methods have been used to prepare nanocomposites. Thus, more concern has been related to the in situ fabrication of nanoparticles of inorganic materials in polymer to prepare new semiconductor characterization [2]. The UV-visible spectroscopy is the most commonly technique used for optical and electronic characterizations of polymer films. In addition, to identify the properties of optical and electronic materials and to characterize the absorption, transmission materials. Thus, this method has many advantages particularly, investigation the band structure and energy gap of both crystalline and non-crystalline materials. The band gaps of material allowed direct and allowed indirect can be calculated by Uv spectrum.

The dependent of size property of polymer -semiconductor nanocomposites compose this material especially attractive in conditions of their potential application in a variety of fields of technical such as single electron transistors, optical switch, solar cells, non-linear optics, optoelectronics devices [3]. The creation of polymer composites by means of polymer matrix that can offer high tensile strength and non-toxicity will be appropriate for food packaging and biomedical applications. Polyvinyl alcohol (PVA) offers the property of biocompatibility, non-toxicity, water solubility, superior tensile strength and is gradually replacing other non-biocompatible plastics like polyethylene, polypropylene, HDPE etc. in many fields [4]. The polyvinyl alcohol is semicrystalline, with low electrical conductivity. The crystal amorphous of PVA lead to interfacial effects resulting in a certain physical characteristics for polyvinyl alcohol. So, the electrical characteristics may be modified to a exact requirement by the suitable doping substance addition [5]. The aim of this is to improve the optical characteristics of PVA by adding of ZrO_2-SiC NPs to use for various optoelectronics devices.

2. Material and Methods

Polyvinyl alcohol (PVA)/ zirconium oxide (ZrO_2)- silicon carbide (SiC) films synthesized by casting technique. The PVA solution prepared by dissolving of 0.5 gm in distilled water (20 ml). The ZrO_2-SiC NPs (1:1) added to PVA solution with ratios (2, 4 and 6) wt.%. The samples examined by

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