Advances in Physics Theories and Applications
ISSN 2224-719X (Paper) ISSN 2225-0638 (Online)
Vol.20, 2013

Preparation and Characterization of (PVA-$FeNO_3$) Composites

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Abstract
This works investigate the effects of addition $FeNO_3$ on optical properties of poly-vinyl alcohol(PVA). The specimens were prepared by adding $FeNO_3$ to the solution of poly-vinyl alcohol with weight percentages from $FeNO_3$ are(0,1,2,3)wt.%. The experimental Results show that the absorbance of (PVA-$FeNO_3$)composites increases with increase the weight percentages of $FeNO_3$. The refractive index, real part of dielectric constant, Berwster angle and coefficient of finesses are increasing with increase weight percentages of $FeNO_3$.
keywords: , poly-vinyl alcohol, optical properties, Composites.
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Introduction

Polymer materials are often filled with inorganic compounds in order to improve their properties[1]. The enhanced properties of composite materials depend on the compatibility of polymer and its filler. Because of the strength of interfacial bonding between the filler and the polymer matrix would have influences upon the overall mechanical properties of the composites [2]. To the separation scientists, the combination of solubilizing properties of the water-soluble polymer molecules and inorganic salts is an interesting area in the field of extraction and fractionation. Several liquid phase extraction technologies employing phase-forming polymers in aqueous solution have the potential to replace volatile organic compounds in classical solvent extraction technologies[3]. Polyvinyl alcohol (PVA) is a polymer with several interesting physical properties, which are very useful in technical applications. PVA, as semicrystalline material, exhibits certain physical properties resulting from the crystal-amorphous interfacial effect[4]. This study deals with results of the effect of $FeNO_3$ on optical properties of polyvinyl alcohol.

Materials and Methods

The materials used in this work are polyvinyl alcohol and $FeNO_3$. The weight percentages of $FeNO_3$ are (0,1,2 and 3)wt.%. The samples were prepared by dissolved $FeNO_3$ in 30 mL of a 3% solution of PVA. The transmission and absorption spectra of PVA- $FeNO_3$ composites have been recording in the length range (190-850) nm using double-beam spectrophotometer (UV-210^{o}A shimedza).

Results and Discussion

Figure(1) shows the behavior of optical absorbance of (PVA-$FeNO_3$) composites with wavelength. The figure shows that the absorbance increases with increase the weight percentages of $FeNO_3$, this attribute to absorbance of $FeNO_3$.

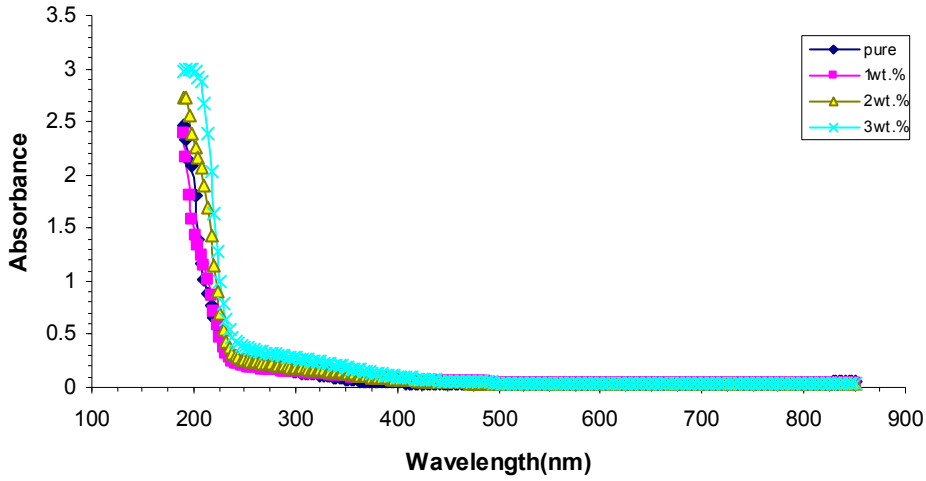

FIG.1
Effect of $FeNO_3$ concentration on Optical absorbance for (PVA-$FeNO_3$) composite

The relationship between refractive index of composites and photon energy of different weight percentages of $FeNO_3$ is shown in figure(2). The refractive index of composites increases with increase the $FeNO_3$ concentrations, this behavior relate to increase of the density with increase the concentration of $FeNO_3$ [5].

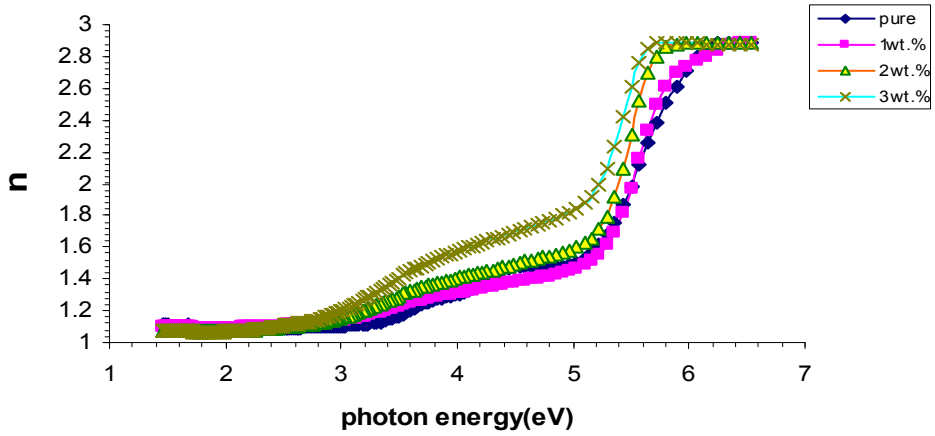

FIG.2
Effect of $FeNO_3$ concentration on refractive index for (PVA-$FeNO_3$) composite.

The relationship between real part of dielectric constant ($\varepsilon_1 = n^2$)[8] and energy photon of (PVA-$FeNO_3$) composites are shown in figure(3).

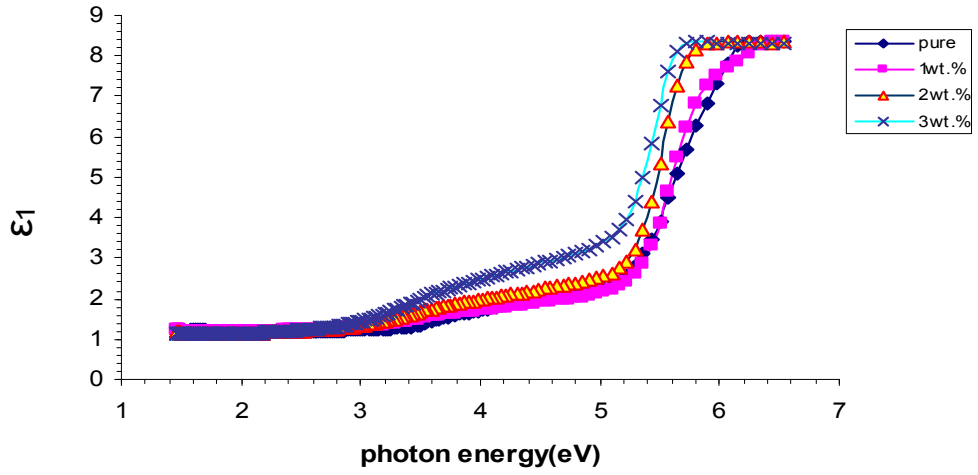

FIG.3
Effect of $FeNO_3$ concentration on real part of dielectric constant (PVA-$FeNO_3$) composite.

The real part of dielectric constant of composites increased with increase the $FeNO_3$ concentration, this attribute to increase the refractive index of composites with increase the weight percentages of $FeNO_3$ [6].

The variation of Berwster angle($\theta_B = \tan^{-1}(n)$)[7] with photon energy is shown in figure(4). The Berwster angle of composites increased with increase weight percentages of $FeNO_3$. The increase of Berwster angle with concentration of $FeNO_3$ related to increase refractive index with increase the weight percentages of $FeNO_3$.

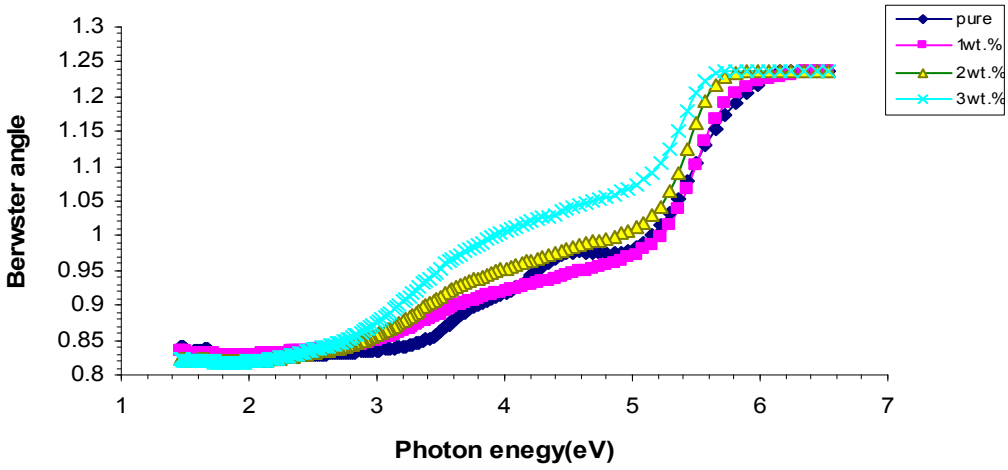

FIG.4
Effect of $FeNO_3$ concentration on Berwster angle (PVA-$FeNO_3$) composite.

The behavior of coefficient of finesses[$(F = \frac{4R}{(1-R)^2})$ where R is reflectance][8] with photon energy of different $FeNO_3$ concentrations. The figure shows that the coefficient of finesses increased with increase $FeNO_3$ concentration. This behavior attribute to increase refractive index with increase the $FeNO_3$ concentration.

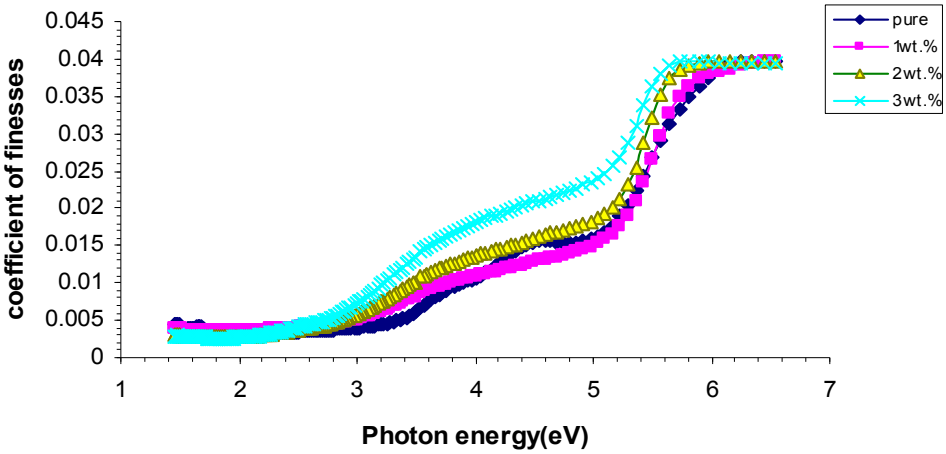

FIG.5

Effect of $FeNO_3$ concentration on coefficient of finesses (PVA-$FeNO_3$) composite.

Conclusions

1- The absorbance of (PVA-$FeNO_3$) composites increases with increase of weight percentages of $FeNO_3$.
2- The refractive index, real part of dielectric constant, Berwster angle and coefficient of finesses of (PVA-$FeNO_3$) composites are increasing with increase concentration of $FeNO_3$.

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