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Preparation of (PVA-$AlCl_3.6H_2O$) Composites and Study Optical Properties

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Abstract

The purpose of the study effect of addition $AlCl_3.6H_2O$ on optical properties of solution consisting of poly-vinyl alcohol (PVA) and $AlCl_3.6H_2O$. The samples were prepared by adding $AlCl_3.6H_2O$ to the solution of poly-vinyl alcohol with weight percentages from $AlCl_3.6H_2O$ are (0,4,6,8)wt.%. Results show that the absorbance of composites increases with increase the concentration of $AlCl_3.6H_2O$, refractive index real part of dielectric constant, Berwster angle and coefficient of finesses are increasing with increase weight percentages of $AlCl_3.6H_2O$.

Keywords: Optical properties, poly-vinyl alcohol, composites.

Introduction

The properties of polymer-mineral reinforced composites are determined by the component properties (particle shape, surface area, surface chemistry, polymer microstructure) and as well as by the processing method and processing conditions. Among of processing methods, injection molding has strong influence on the internal microstructure of polymers and in a consequence on mechanical response of the material. Final properties of the thermoplastic composites are also caused by the particle filler shape (platelet, fibrous or irregular) and its orientation formed during polymer melt flow[1]. PVA is a water-soluble synthetic polymer. Due to the characteristics of easy preparation, good biodegradability, excellent chemical resistance, and good mechanical properties, PVA has been used on many biomaterial applications[2]. This present work deals with results of the effect of $AlCl_3.6H_2O$ on optical properties of polyvinyl alcohol.

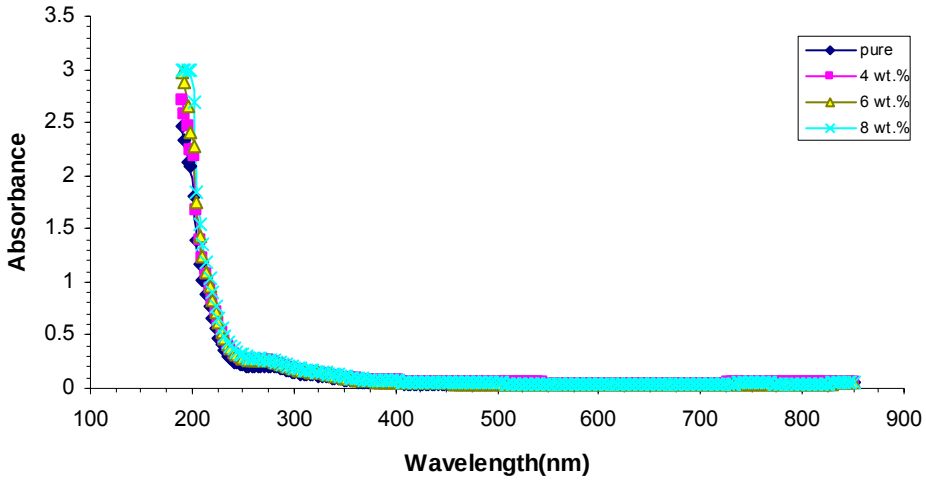
Materials and Methods

The materials used in this paper are polyvinyl alcohol and $AlCl_3.6H_2O$. The weight percentages of $AlCl_3.6H_2O$ are (0,4,6 and 8)wt.%. The samples were prepared by dissolved $AlCl_3.6H_2O$ in 30 mL of a 3% solution of PVA. The transmission and absorption spectra of PVA- $AlCl_3.6H_2O$ composites have been recording in the length range (190-850) nm using double-beam spectrophotometer (UV-210^{o}A shimedza).

Results and Discussion

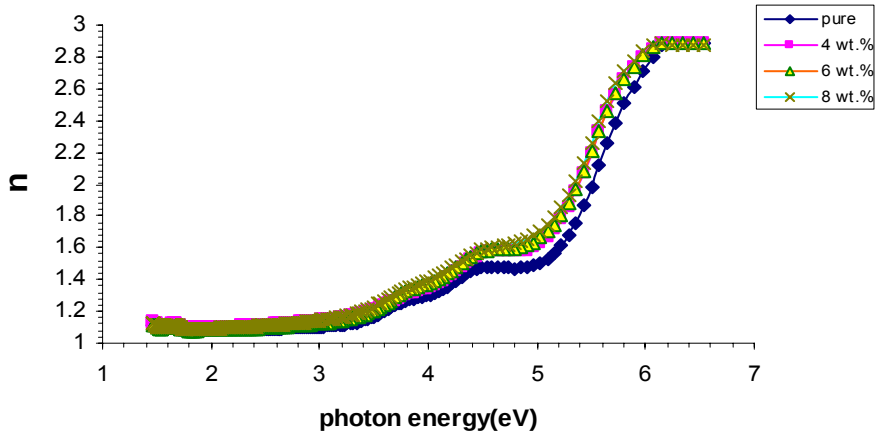
Figure(1) shows the optical absorbance as a function of the wavelength of composites. The figure indicate the fact that the absorbance increases by adding different weight percentages of $AlCl_3.6H_2O$, this related to absorbance of $AlCl_3.6H_2O$.

Figure 1: Effect of $AICI_3.6H_2O$ concentration on Optical absorbance for (PVA-$AICI_3.6H_2O$) composite



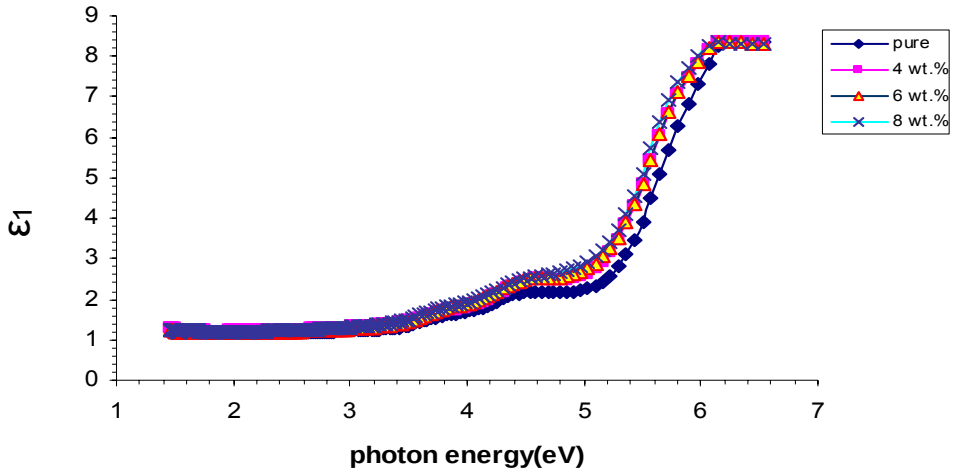
The behavior of refractive index of composites with photon energy of (PVA- $AlCl_3.6H_2O$) composites is shown in figure(2). The figure shows that the refractive index of (PVA- $AlCl_3.6H_2O$) composites increases with increase the $AlCl_3.6H_2O$ concentrations, this behavior attribute to increase of the density with increase the concentration of $AlCl_3.6H_2O$ [3].

Figure 2: Effect of $AICI_3.6H_2O$ concentration on refractive index for (PVA-$AICI_3.6H_2O$) composite



The behavior of real part of dielectric constant ($\varepsilon_1=n^2$)[8] with energy photon of composites are shown in figure(3).

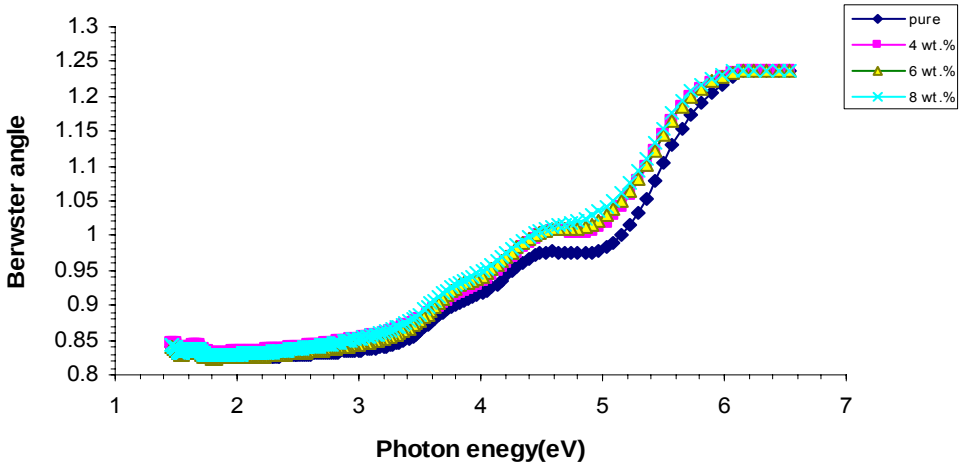
Figure 3: Effect of $AICI_3.6H_2O$ concentration on real part of dielectric constant (PVA-$AICI_3.6H_2O$) composite.



The figure shows that the real part of dielectric constant of (PVA- $AlCl_3.6H_2O$) composites increases with increase the $AlCl_3.6H_2O$ weight, this behavior attribute to increase the refractive index with increase the weight percentages of $AlCl_3.6H_2O$ [4].

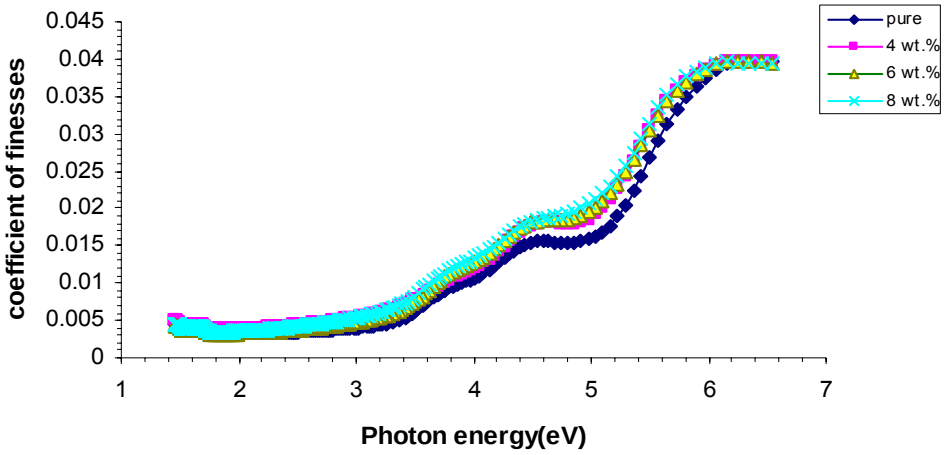
The behavior of Berwster angle($\theta_B = \tan^{-1}(n)$)[5] with photon energy is shown in figure(4).This figure shows the Berwster angle of (PVA- $AlCl_3.6H_2O$) composites increases with increase concentration of $AlCl_3.6H_2O$. The increase of Berwster angle with concentration of $AlCl_3.6H_2O$ related to increase refractive index.

Figure 4: Effect of $AICI_3.6H_2O$ concentration on Berwster angle (PVA-$AICI_3.6H_2O$) composite.



The variation of coefficient of finesses[$(F = \frac{4R}{(1-R)^2})$ where R is reflectance][6] with photon energy of different concentrations of $AlCl_3.6H_2O$. The coefficient of finesses increased with increase $AlCl_3.6H_2O$ concentration. This behavior attribute to increase refractive index.

Figure 5: Effect of $AlCl_3.6H_2O$ concentration on coeffcient of finesses (PVA-$AlCl_3.6H_2O$) composite.



Conclusions

1. The absorbance of (PVA- $AlCl_3.6H_2O$) composites increases with increase of weight percentages of $AlCl_3.6H_2O$.
2. The refractive index, real part of dielectric constant, Berwster angle and coefficient of finesses of (PVA- $AlCl_3.6H_2O$) composites are increasing with increase concentration of $AlCl_3.6H_2O$.

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