Preparation of (Pomegranate Peel- Polystyrene) Composites and Study their Optical Properties

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Abstract
In this work, samples of pure polystyrene and polystyrene (PS) doped with (pomegranate peel) were prepared using casting method .The effect of addition of pomegranate peel (PP) concentration on optical properties of poly styrene have been studied in the wavelength range (200-800)nm. The absorption coefficient, energy gap, refractive index and extinction coefficient have been determined. The results show that the optical constants change with increase of PP concentration.
Key words: polymer **,** Polystyrene**,** pomegranate peel, Optical properties, absorbance.

1.Introduction

Optical polymers have attracted considerable attention in recent years because of their important industrial applications. The study of phase separation in thin films of binary mixtures is commercially important for the effective production of various coatings and films, including dielectric layers, photographic materials and paint systems. While film of polymer blends often exhibit more desirable characteristics than individual homo polymers, most blend components are also highly incompatible with each other and will demix and phase-separate. The degree of separation in blends will greatly affect the resulting morphology, which can have adverse affects on the properties of the resulting film[1-3]. One method often used to improve properties of a specific conductive polymer is to prepare composites using selective inorganic oxides such as SiO2, TiO2, and zeolite [4-6]. Some other useful methods are the prepa-ration of blends, composites, or copolymers of poly thiophene using insulating polymers as processing aid [7–13]. Ideally, such composites would possess a combination of the outstanding process ability and thermal stability characteristic of the insulating polymers and the electrical conductivity and optical properties of the conduct-ing polymers, resulting in an interesting advanced material. Among insulating polymers, polystyrene (PS) and poly methyl methacrylate (PMMA) show good and mechanical properties. PS and PMMA are chemically stable thermoplastics that are designed for applications requiring optical transparency and outstanding mechanical behavior as well as good process ability.
The objective of this study was to help in understanding the effect of different concentrations of (PP) on the optical properties of (PS).

2.Experimental Part

The polymer (PS) was dissolved in chloroform by using magnetic stirrer in mixing process to get homogeneous solution. The weight percentages of PP are (2, 4 ,6 wt%) were added and mixed for 10 minute to get more homogenous solution , after which solution was transferred to clean glass Petri dish of (5.5cm) in diameter placed on plate form. The dried film was then removed easily by using tweezers clamp. The polymer systems were evaluated spectra photo metrically by using UV/160/Shimadzu spectrophotometer.

3.Results & Discussion

3.1 The absorbance of composites

Fig(1) shows the relationship between absorbance of PS-PP composite with wave length, from the figure it was appeared that the absorbance tends to decrease with the wavelength increasing.

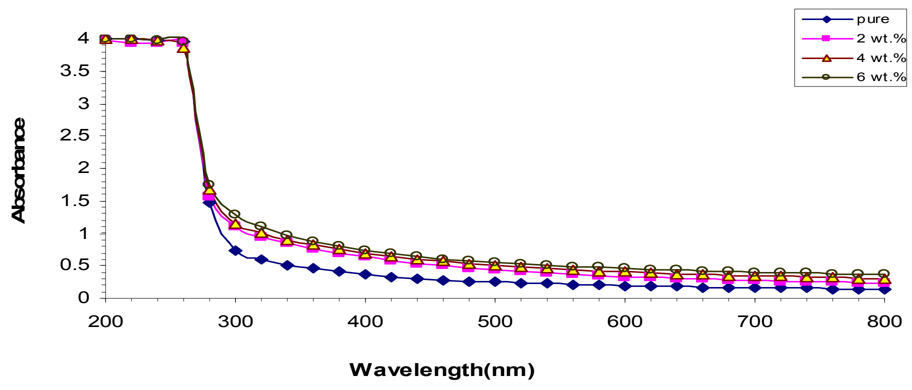

FIG.1 The relationship between absorbance and the wave length of PS-PP

Fig(2) shows the optical absorption spectrum of composite for different impurities quantities, it was found that the composite have a low absorption coefficient at a small photon energy then increase at different rates dependence on the composite structure. The pure sample had low absorption coefficient this may be as a result of low crystalinity.

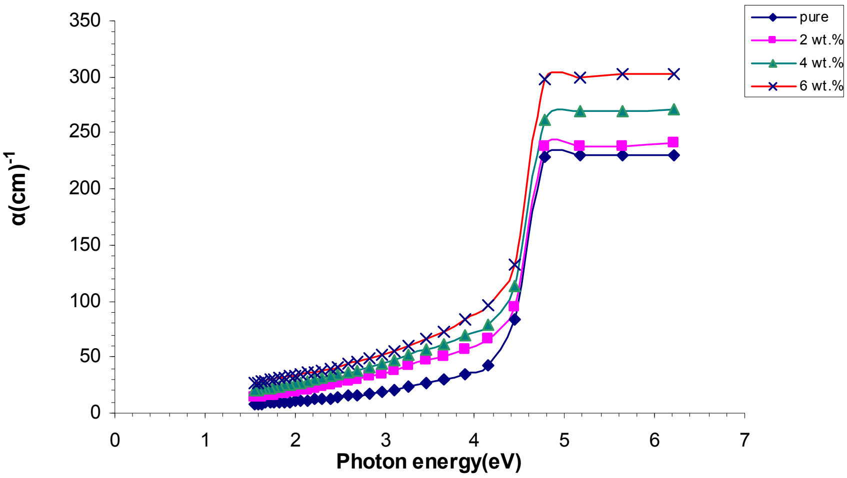

FIG. 2 The Absorption Coefficient Of PS-PP Composite With Photon Energy

Fig (3) and Fig(4) represented the direct transition , the energy gab values dependence in general on the crystal structure of the composites and on the6arrangement and distribution way of atoms in the crystal lattice .

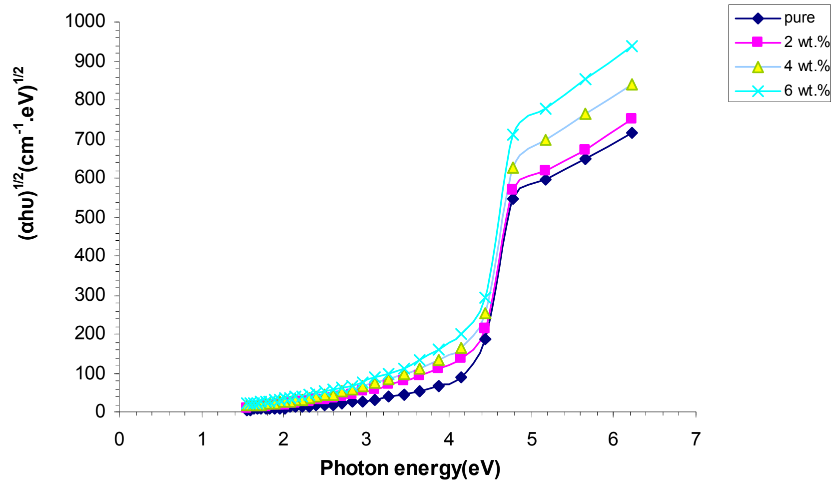

FIG.3 relationship between $(\alpha h\upsilon)^{1/2}(cm\text{-}1.eV)^{1/2}$ and photon energy of PS-PP composites.

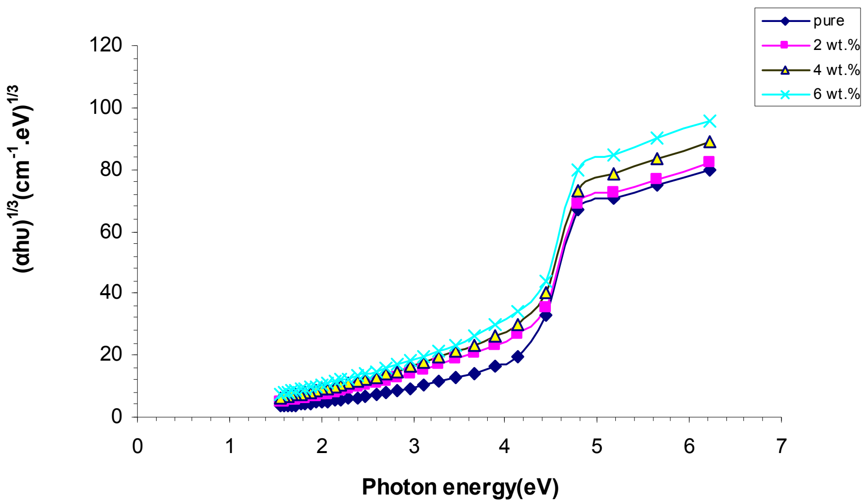

FIG.4 the relationship between $(\alpha h\upsilon)^{1/3}(cm^{-1}.eV)^{1/3}$ and photon energy of PS-PP composites

3.3Refractive Index and Extinction Coefficient

Fig. (5) shows the variation of refractive index(n) with of the composite with a given photon energy the values increase exponentially with increasing photon energy . This increase indicates that the electromagnetic radiation passing through the material is faster in the low photon energy.

Fig. (6) represent the variation of the extinction coefficient(k) with the incident photon energy in this figure the variation is simple in the low energy region while the variation increased in the high photon energy region this behavior may be as a result to the variation of the absorption coefficient which leads to spectral deviation in the location of the charge polarization at the attenuation coefficient due to the loses in the energy of the electron transition between the energy bands .

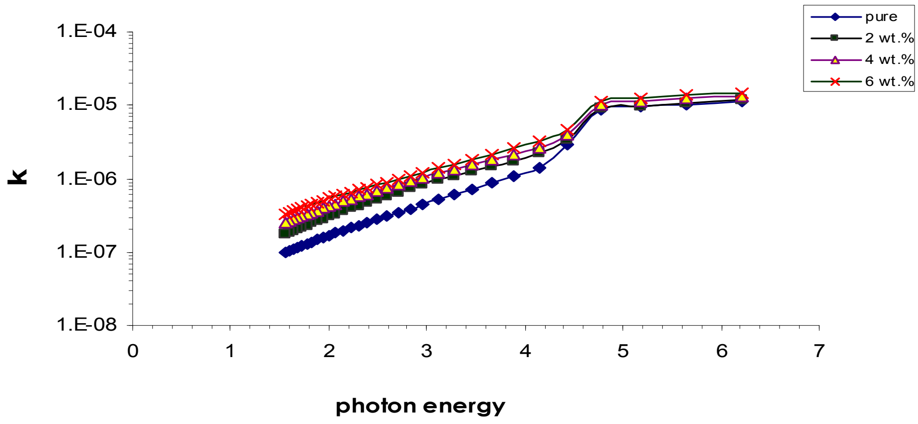

FIG.5 The Extinction Coefficient Of PS-PP Composite With Various Photon Energy

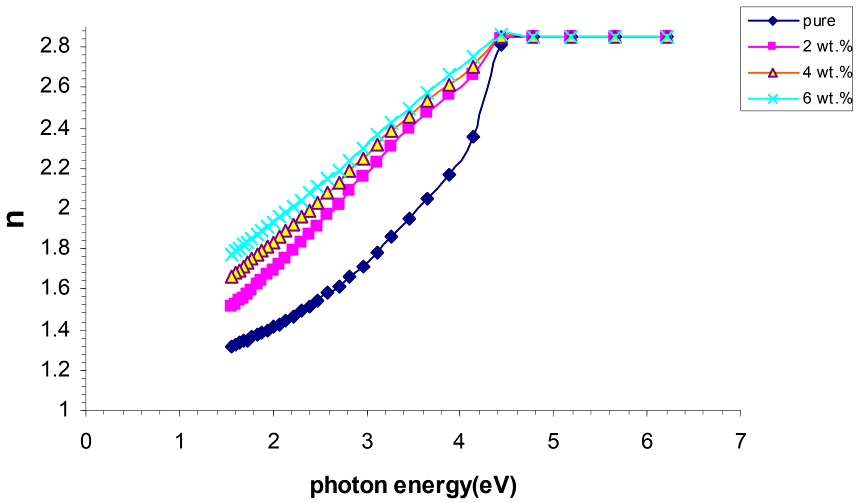

FIG.6 The Relationship Between Refractive Index For (PS-PP) Composite With Photon Energy

3.4dielectric constant

Fig.(7) & (8) represent the real and imaginary parts of the dielectric constant respectively in the real part the variation is very clear spatially in the high impurities concentration this may be due to the no resonance between the frequencies of the incident photon energy (electromagnetic and the induced dipoles in the composite), while in the imaginary part there is an absorption to the energy of the incident photon energy, so the variation nearly constant until it reaches to the high photon energy . The pure composite shows the smaller variation

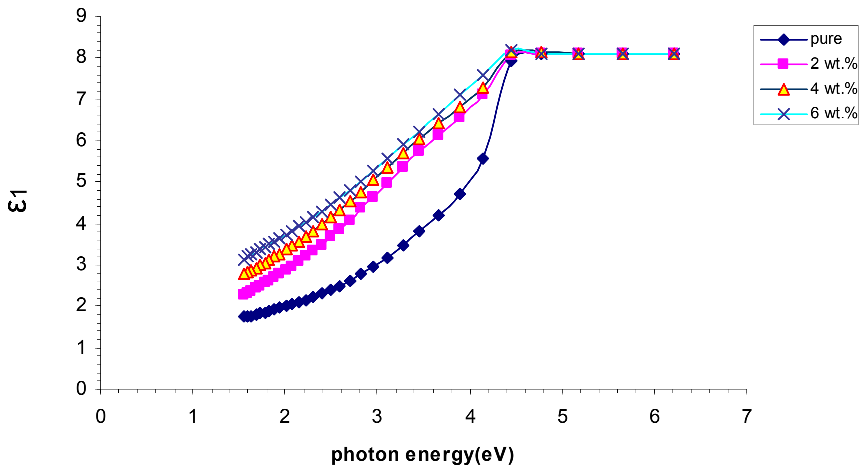

FIG.7 The Variation Of Real Part Of Dielectric Constant PS-PP With Photon Energy

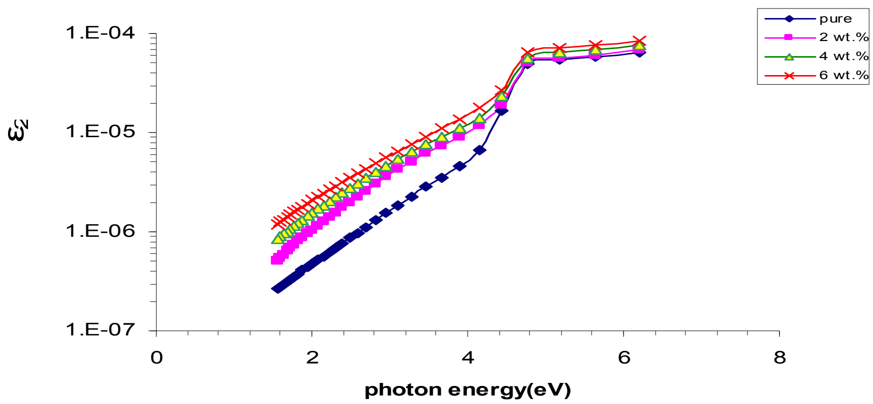

FIG. 8 The Variation Of Imaginary Part Of Dielectric Constant Of PS-PP Composite With Photon Energy

Conclusions

- The absorbance is very large in the uv, region. The absorption coefficient is smaller and stable in the low photon energy.
- The absorption and (k) will increase as a result of the scattering centers in the composites. The values of the refractive index(n) of the composites increase exponentially with increasing photon energy .
- The real and imaginary dielectric constant shows the exponential increase with increasing the incident photon energy.

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