When the (k →0)

$$R= (n-1)^2/ (n+1)^2 \quad (7)$$

$$n= (1+R^{1/2})/ (1-R^{1/2}) \quad (8)$$

The extinction coefficient (k) was calculated using the following equation:

$$K=\alpha\lambda/4\pi \quad (9)$$

Dielectric constant is defined as the response of the material toward the incident electromagnetic field. The dielectric constant of compound (e) is divided into two parts real(e_1), and imaginary (e_2).The real and imaginary parts of dielectric constant ($e_1$and e_2) can be calculated by using equations [5]:

$$e=e_1 – ie_2 \quad (10)$$

$$e_1=n^2-k^2 \text{ (real part)} \quad (11)$$

$$e_2=2nk \text{ (imaginary part)} \quad (12)$$

The resistivity was measured over range of temperature from (30 to 80)^{o}C using Keithly electrometer type (616C) .The volume electrical conductivity σ_v defined by :

$$\sigma_v = \frac{1}{\rho_v} = \frac{LV}{AI}. \quad (13)$$

Where,

A = guard electrode effective area.

V/I=R = volume resistance (Ohm).

L = average thickness of sample (cm).

In this model the electrodes have circular area A= $D^2\pi/4$ where D= 0.5 cm^2.

The activation energy was calculated using equation:

$$\sigma = \sigma_o \exp(-E_a/k_BT) \quad (14)$$

σ = electrical conductivity at T temperature
σ_0 = electrical conductivity at absolute zero of temperature
K_B = Boltzmann constant
E_a = Activation Energy

3. Results and Discussion

3.1 The Absorbance of (PS-PMMA-$ZnCl_2$) Composites

Figure (1) shows the spectral dependence of the absorbance of the (PS-PMMA-$ZnCl_2$) composites with different concentrations of salt. The absorbance is very large in the UV- region; this decay becomes relatively slower in the visible and near infrared regions, this attributed to the absorbance of polymers (PS and PMMA) in the UV- region. Also, the absorbance of composites is increased with increase the concentration of zinc chloride, this behavior due to the absorbance of salt [6].

3.2 The Absorption coefficient and energy gap of composite

The variation of the absorption coefficient of the composites with photon energy is shown in figure (2). From this figure, we can see that the absorption coefficient is increased with increasing of the zinc chloride concentration which may be due to the absorption by the impurities .The absorption coefficient is smaller and stable in the low photon energy because of the scattering of the photon energy [6].

Figures (3 and 4) show the energy band gap of composites. From the value of the absorption coefficient, we can conclude that the composites have indirect energy band gap. The energy band gap is calculated by using Eq.(5) as shown in figures(3 and 4), it is decrease with increasing the zinc chloride concentration, this attributed to decrease the distant between the conduction band and valance band with the increase zinc chloride concentration[3].

3.3 Refractive Index and Extinction Coefficient

The variation of the extinction coefficient (K) of (PS-PMMA-$ZnCl_2$) composites as a function of the incident photon energy is shown in figure (5). The extinction coefficient is increased with the increase the zinc chloride concentration. By increasing the concentration of the zinc chloride the deviation from the chemical equilibrium increases too, so the absorption and (k) will increase as a result of the scattering centers in the composites [6].

Figure (6) shows the variation in the refractive index (n) of composites with incident photon energy. The values is increased with increasing photon energy. This indicates that the electromagnetic radiation pass though the material is slower in the VIS and UV regions however the speed is higher in the visible and near Infrared region. Also, the increase of refractive index with the increasing of concentration of the zinc chloride attributed to increase the density of composites [7].

3.4 Dielectric Constant

Figures (7 and 8) show the variation of the real and imaginary dielectric constant with photon energy respectively. The real and imaginary dielectric constants are increasing with the increase the zinc chloride concentration. The behavior of the real and imaginary dielectric constant related to increase the numbers of charge carries. .The concentration of the additives plays an important role in both cases due to the electronic polarization. The effect is very clear in the high photon energy region [7].

3.5 The Effect of Zinc Chloride concentrations on D.C Electrical Conductivity of (PS-PMMA-$ZnCl_2$) Composite

The variation of D.C electrical conductivity of (PS-PMMA-$ZnCl_2$) composite is shown in figure (9). This figure shows that the D.C electrical conductivity increases with the increase of concentration of the zinc chloride. The behavior of D.C electrical conductivity with concentration of salt attributed to increase of carries charge in composites [8].

3.6 The Variation of the D.C Electrical Conductivity of (PS-PMMA-ZnCl2) Composites with Temperature

Figure (10) shows the variation of D.C electrical conductivity of composites with temperature. We can see that the electrical conductivity of composites is increased with increase the temperature this attributed to increase the movement of polymer chains and ions of $ZnCl_2$ with increasing the temperature [9].

3.7 Activation Energy

The activation energy was calculated by using Eq. 14 as shown in figure (11). The activation energy of D.C electrical conductivity of ($PS-PMMA-ZnCl_2$) composites is decrease with increasing the salt concentration, this behavior due to decrease the distance between conduction band and valance band with increasing the zinc chloride concentration [10].

4. Conclusions

- The absorbance is very large in the UV, region and it is increased with increasing the concentration of zinc chloride.
- 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.
- The optical constants are increased with increasing the zinc chloride concentration.
- The electrical conductivity was increased with increasing the concentration of salt and temperature
- The activation energy was decreased with increasing the weight percentages of zinc chloride.

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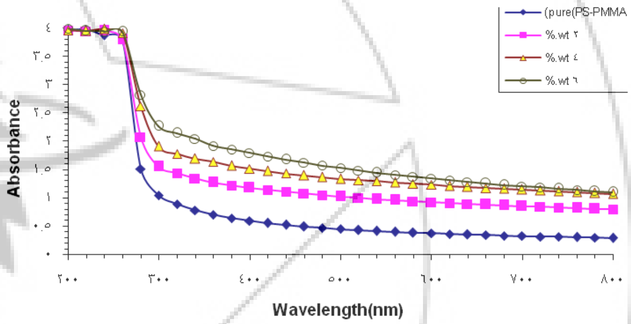
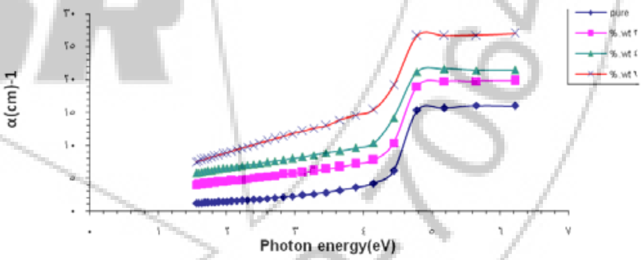


FIG.1
The variation of optical absorbance for (PS-PMMA-$ZnCl_2$) composite with wavelength



FIG(2)
The variation of the absorption coefficient of the composites with photon energy

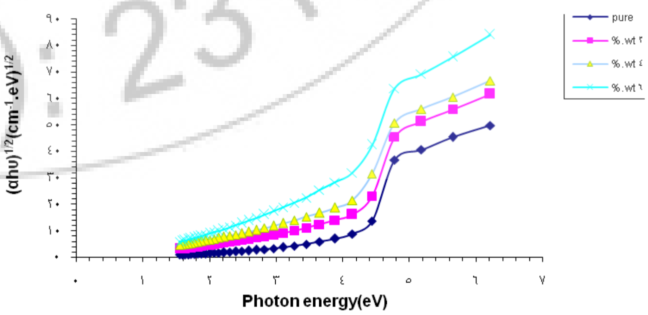


FIG.3
The relationship between $(\alpha h\upsilon)^{1/2}(cm^{-1}.eV)^{1/2}$ and photon energy of composites.

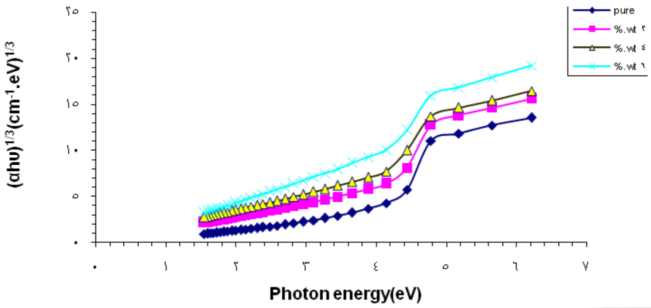


FIG.4
the relationship between $(\alpha h\upsilon)^{1/3}(cm^{-1}.eV)^{1/3}$ and photon energy of composites.

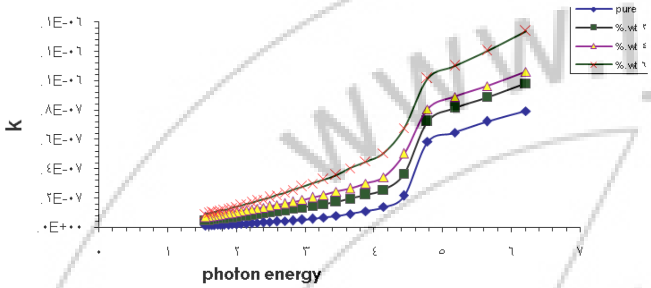


FIG.5
The extinction coefficient for (PS-PMMA-$ZnCl_2$) composite with various photon energy

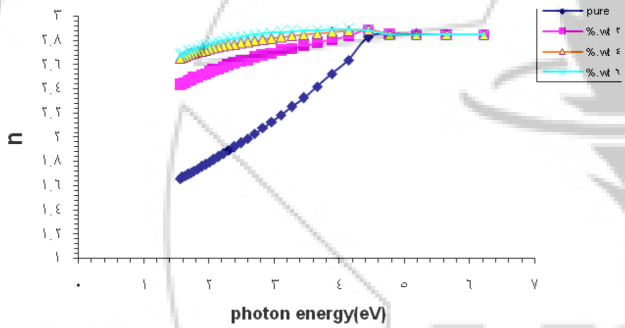


FIG.6
The relationship between refractive index for composite with photon energy

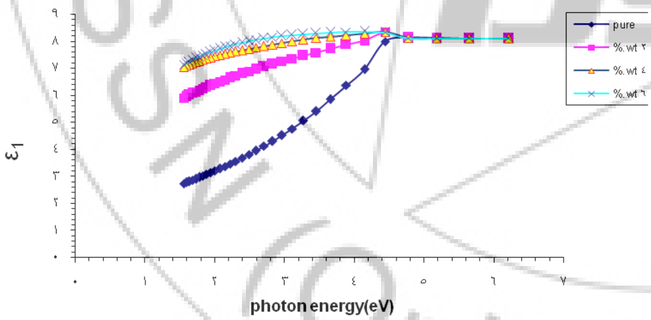


FIG.7
The variation of real part of dielectric constant (PS-PMMA-$ZnCl_2$) composite with photon energy

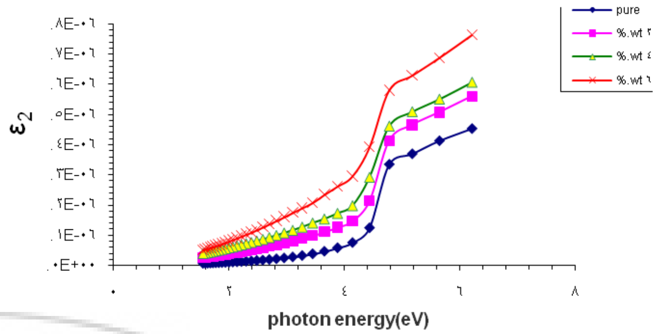


FIG.8
The variation of imaginary part of dielectric constant composite with photon energy

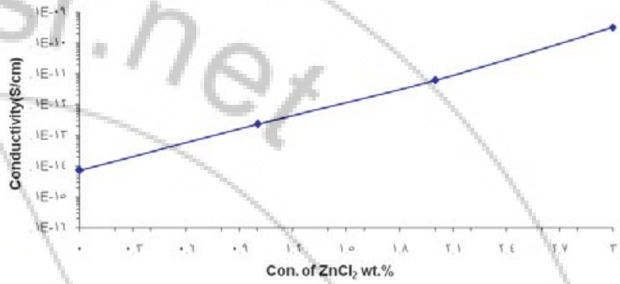


FIG.9
Variation of D.C electrical conductivity with $ZnCl_2$ wt.% concentration of composite.

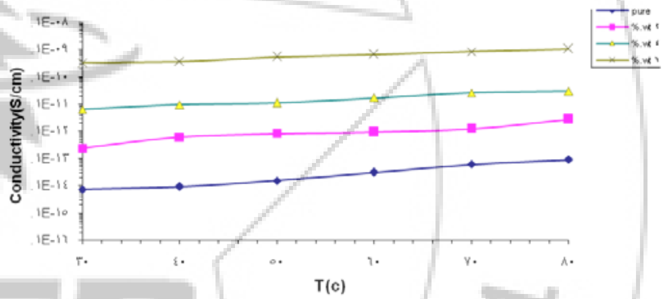


FIG.10
Variation of D.C electrical conductivity with temperature for composite

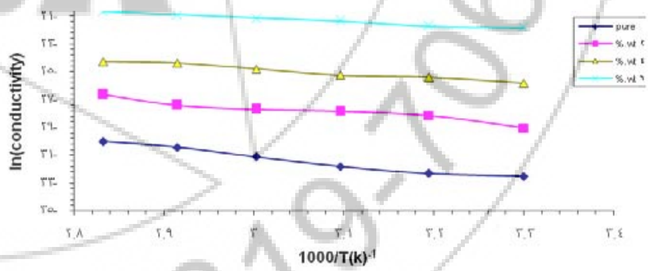


FIG.11
Variation of D.C electrical conductivity with resprocal absoute temperature for composite.

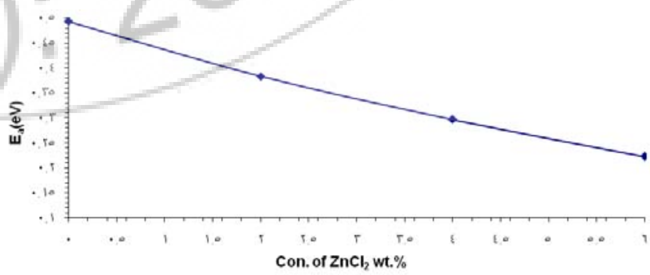


FIG.12
Variation activation energy for D.C electrical conductivity with $ZnCl_2$ concentration of composite