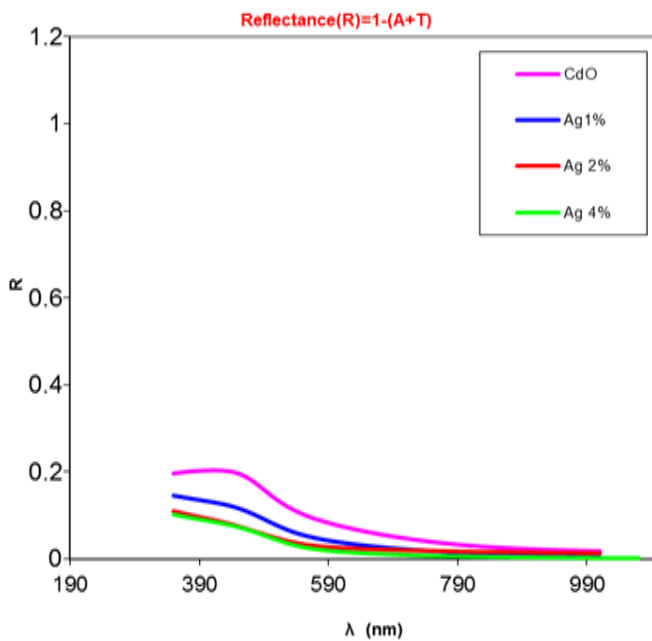


**Figure 5:** Absorbance of the undoped and Ag-doped CdO Film For 2 layers.



**Figure 6:** reflectance spectra of the undoped and Ag-doped for 2 layers.

$$\alpha h\nu = A(h\nu - E_g)^{1/2} \dots\dots\dots 2$$

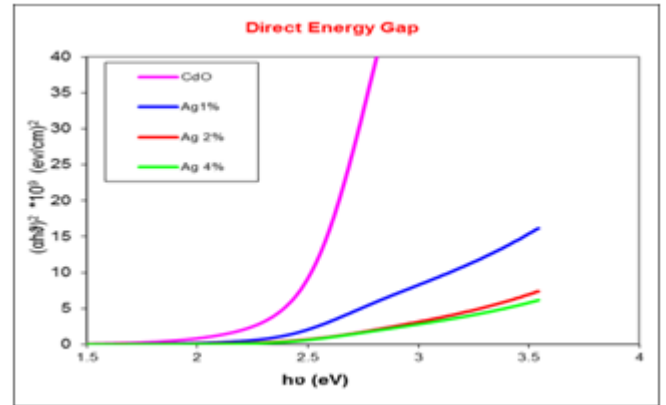
Where:

A = is a constant.

$h\nu$  = is the photon energy .

$E_g$  = is the optical band gap.

The values of the optical band gap ( $E_g$ ) values of the films were obtained from the intercept of  $(\alpha h\nu)^2$  vs.  $h\nu$  curves plotted. Fig. (6) displays the plots of  $(\alpha h\nu)^2$  vs.  $h\nu$ . It is seen that  $E_g$  values increase with silver (Ag) dopant. The blue shift in the optical band gaps of the films may be attributed to the band Burstein–Moss effect. This effect is frequently observed in n-type semiconductors. The increase of carrier concentration in doped thin film will cause the Fermi level move into the conduction band. The filling of the conduction band by electrons will generally result in blue shift in the near band edge emission.



**Figure 7:** the plots of  $(\alpha h\nu)^2$  vs. photon energy of the undoped and Ag-doped for 2 layers.

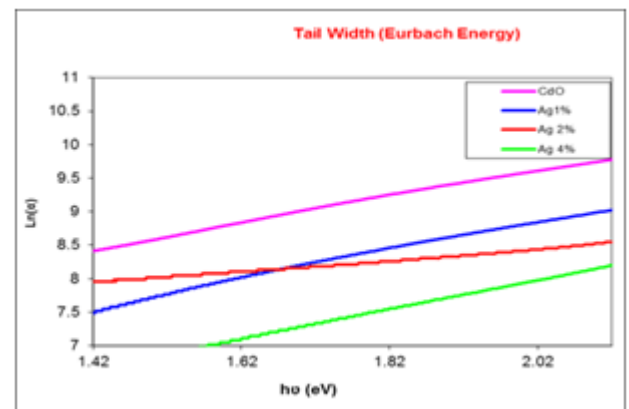
The width of the localized states available in the optical band gap of the films affects the optical band gap structure and optical transitions and it is called as Urbach tail, which is related directly to a like exponential tail for the density of states of either one of the two band edges [26]. The Urbach tail of the films can be determined by the next relation [27]:  $\alpha = \alpha_0 \exp(E/E_u) \dots\dots\dots 3$

where:

$E$  = is the photon energy.

$\alpha_0$  = is constant .

$E_u$  = is the Urbach energy which refers the width of the exponential absorption control . Fig. (8) displays the variation of  $(\ln \alpha)$  vs. photon energy for the films. This behavior corresponds primarily to optical transitions between occupied states in the valence band tail to unoccupied states at the conduction band edge.



**Figure 8:** The plots of  $(\ln \alpha)$  vs. photon energy of the undoped and Ag-doped CdO films for 2 layers .

$$E_u = \left( \frac{d(\ln \alpha)}{d(\ln(h\nu))} \right)^{-1} \dots\dots\dots 4$$

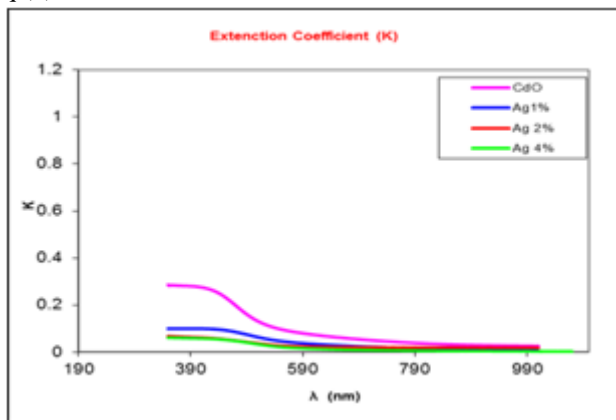
Urbach energy values of the films decrease with increasing Silver dopant. The ( $E_u$ ) values change inversely with optical band gaps of the films. The refractive index dispersion plays an important role in the research for optical materials. Because, it is a significant factor in optical communication and in designing devices for spectral dispersion. The refractive index of the films can be determined by the next relation [28].

$$n = \left( \frac{1+R}{1-R} \right) + \sqrt{\frac{4R}{(1-R^2)} - K^2} \dots\dots\dots 5$$

where:

k ( $k=a\lambda/4\pi$ )= is the extinction coefficient.

The refractive index values of the films were calculated using Eq (5) .



**Figure 9:** Extinction coefficients of the undoped and Ag-doped CdO films for 2 layers .

Fig.( 9) displays the plots of extinction coefficient vs. wavelength for the films. After (400 nm) , the extinction coefficient changes strongly with (Ag dopant) due to the structural changes in the films. As seen in plotted figure of refractive index, the refractive index decreases with (Ag dopant).

#### 4. Conclusions

The undoped and Ag-doped CdO films were deposited by sol-gel spin-coating method. The structural and optical properties of the CdO film were influenced by Ag doping:

- 1) X-ray diffraction (XRD) effects showed films have (111) preferred orientation.
- 2) The optical band gap values were initiate to reduction from (2.39, 2.35 , 2.31 and 2.30 eV ) with Ag doping. The optical constants, refractive index, extinction coefficient and optical dielectric constants, of these films were determined by transmittance and reflectance spectra. Ag doping concentration affects the optical parameters of the thin films.

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