

Effect the Annealing Temperature on the Optical and Electrical Properties for (Cds)Thin Films Prepared by Thermal Evaporation Technique

Emman M.Abid

Assistant Teacher, Dept. of Physics, Baghdad University College of Sciences, Iraq

Abstract: In this paper we the preparing of **cds** thin films and experimenting this properties through change the temperatures of this films. The **cds** thin films have been prepared by thermal evaporation in a vacuum of (10^{-6}) Torr with thickness 750nm at room temperature then hardened at change temperatures of (350,400 ,450)⁰C for 60 min. They study revealed that the (Forbidden Energy) decrease, transmittance showed little decreased. The resistivity has little value in 350 C and then increase

KEYWORDS: Annealing, solarcell, thin film, energy gap

I. INTRODUCTION

Thin film technique has advanced throughout 30 years ago. This improvement was focused run because of the needed a new devices in the electronics and optical productions.[1]

Thin films are used in wafer construction, , a conductor, an insulator,. Thin films defiantly from mass fabrics of similar chemical structure. For example, thin films are subtle to surface possessions whereas mass materials normally aren't.[2](CdS) has a directly band gap equal to 2.42 eV, and fabricated by different method such as , sputtering, , vacuum evaporation, spray pyrolysis, spin coating, , chemical bath deposition (CBD), etc. [3,4]. Cadmium supplied is suitable to use as a defense layer for CdTe and CuIn(Ga)Se₂ solar cells[5]

Thermal evaporation technique used to depositing metal and metal alloys. Vapor is produced by boiling a base material, the vapor is brought from the source to the substrate, and the vapor is dense to a solid film on the substrate surface [6,7]

Many parameter such as pressure, temperatures substrate, rate of deposition, distance from the source, etc can be effect on the properties and quality of the deposited film.[8]

II. EXPERIMENTAL

The glass substrates cleaned with acetone and deionized water and dried.

Then in room temperature and high vacuum of 1×10^{-6} tor Cds bulges (99.999%) put on molybdenum boat Cds films of 750 nm thickness in a deposition rate (4-6 Å/s). The films annealed at three different temperatures, in (350, 400 and 400) C for 60 minutes, Measurements were given after each annealing Reflectance (%R) and Transmission (%T) taken in UV-V spectrophotometer (Perkin-Elmer Lambda 900) between 300 nm and 1100 nm.

The α can be definitely the relative[9]

$$\alpha = (1/t) \ln(1/T) \dots\dots\dots(1)$$

t thickness of the film, T the transmittances

The energy gap, E_g , calculated from the relation for direct band gap material [10],

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

Where A is the constant and, $(h\nu)$ refer to energy of photon.

silver coat electrodes in 2 mm length with 1 mm space was used to study The resistivity of the CdS films by two-probe method.. Digital electrometer (Keithely 616) was used to measure the electrical properties of cds thin films, which were deposited on glass substrates, with different annealing temperatures (350,400,450) C
Thin film resistivity (ρ) is premeditated using the following low:

$$\rho = RA/L \dots\dots\dots(3)$$

R is the resistance,.A show film area. L is the spacebetween the electrodes.[11]

III. RESULT AND DISCUSSION

1-The effect of annealing temperatures on energy gap (E_g):

Fig1 shown the band gap in varied temperature it was increased from 2.3 to 2.42, 2.5eV as soon as the temperature increases and afterward decreased to 2eV above 400°C.

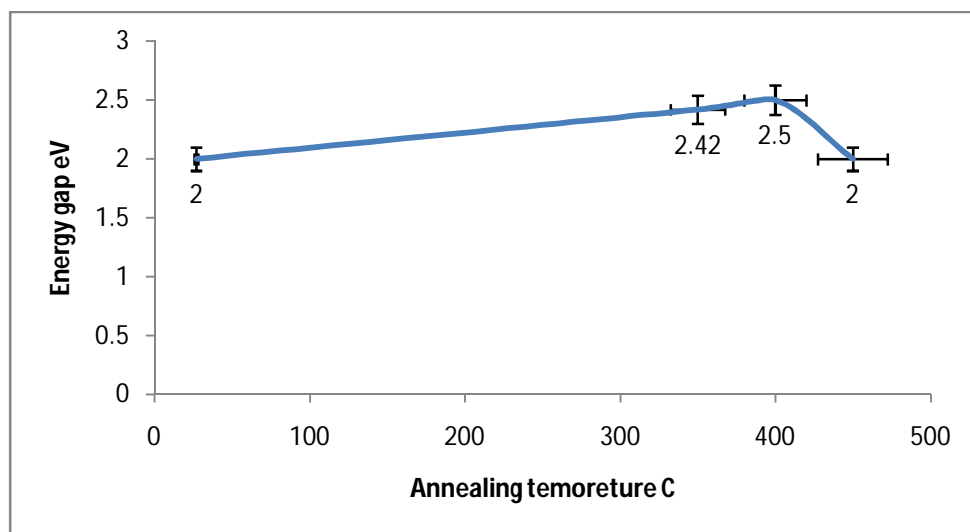


Fig.1 Band gap energy versus temperatures (350,400,450) C for 60 min

2- Effect of annealing temperatures on transmittance T:

The transmittance drop off with rising annealing temperatures since increases the absorption of cds thin film follow improve the crystallite

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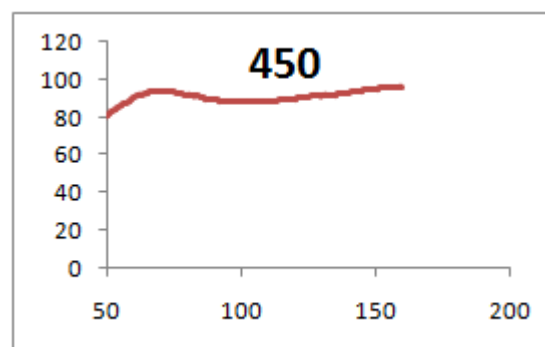
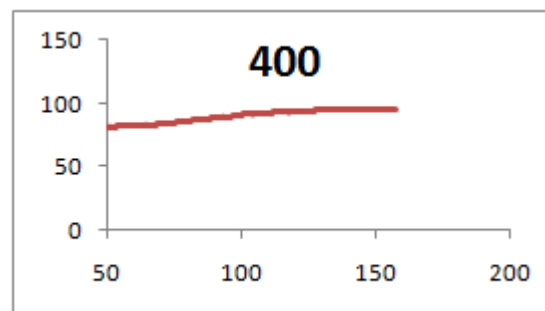
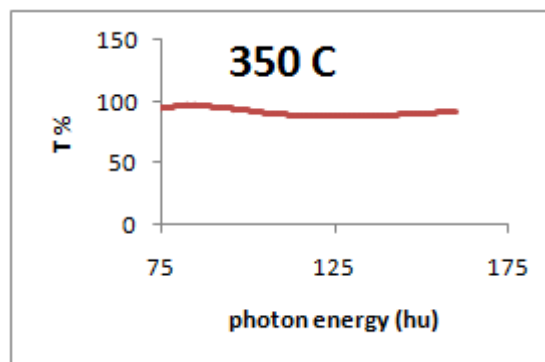
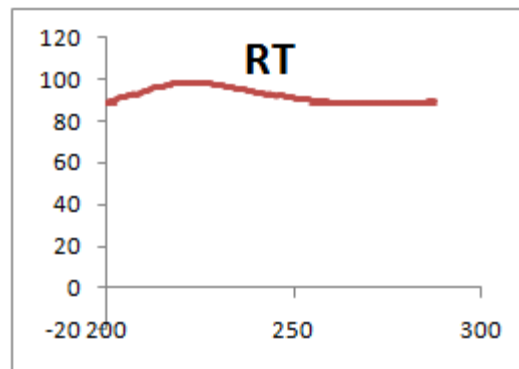


Fig.2 transmittance versus wave length at changed Temperature (350,400,450) C for 60 min

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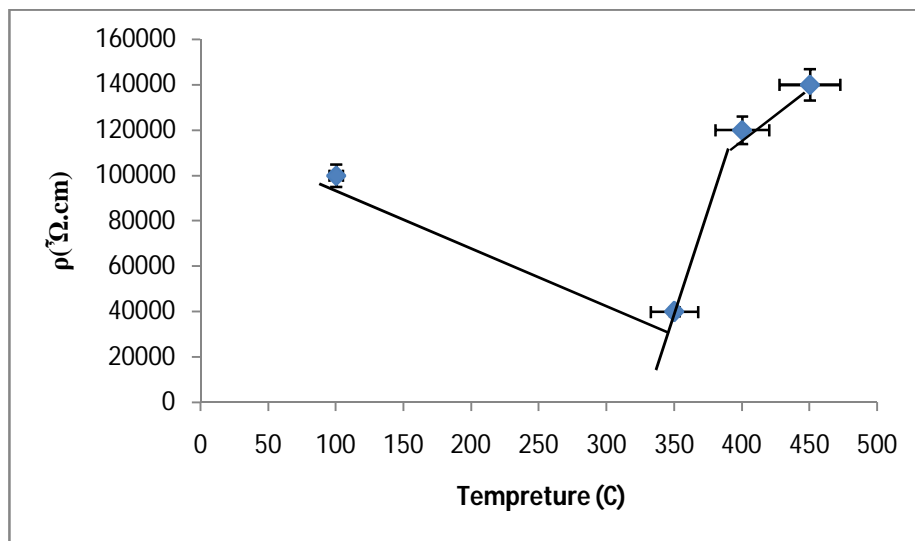
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3- Electrical properties:

Fig 3 shows the resistivity of the films. This fig appears; the resistivity has least possible amount at 350 °C and growth above 350 °C.



Fig(4) the variation of resistivity with temperatures (350, 400, 450) C for 60 min

IV. CONCLUSIONS

We examined the optical and electrical characteristics of the film under different temperatures. The transmittance lessens when the temperature rises. The energy gap increases with increasing annealing temperatures and then decreases above 400 °C. The resistivity decreases with increasing annealing temperature and then increases above 350 °C.

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