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# UV- VIS STUDY OF ANNEALED CdO AND ZnO THIN FILMS

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## ABSTRACT

*The CdS and ZnS thin film synthesized by chemical bath deposition have been extensively studied by many researchers. The quality, efficiency and reliability of the thin film can be enhancing by annealing of the synthesized thin films. In the present work CdO and ZnO thin films have been obtained from thermal annealing of chemically deposited CdS and ZnS thin films. The UV-VIS of thermally annealed CdO and ZnO thin films has been studied. From the UV-VIS data it is observed that annealing of the thin films at a particular temperature enhance the UV-VIS properties of thin films.*

**KEYWORDS:** *CdO, ZnO, annealing, Optical properties, UV-VIS, chemical bath deposition.*

## INTRODUCTION

CdO and ZnO thin films are transparent conducting in nature, inexpensive, mechanically stable and highly resistance to oxidation. These films are an n-type semiconductor belonging to II-VI group of periodic table. These materials possess wide band gap of approximately 2.4eV and 3.3eV at room temperature. Films are semitransparent in nature have been widely used in a flat panel displays, solar cells and gas sensing applications. The CdS and ZnS thin films prepared by chemical bath deposition technique on the glass substrate. In the present work we have attempted to annealed CdS and ZnS films prepared by chemical bath deposition to form CdO and ZnO thin films. [1-5]

The CdO and ZnO films obtained by annealing were characterized for investigation of UV-VIS properties. It is observed that annealing effect improve UV-VIS properties of thin films. [6-7]

## EXPERIMENTAL:

The CdS and ZnS thin films synthesized by chemical bath deposition technique. In the apparatus of chemical bath deposition there is a facility for rotating the substrate using d. c. motor, stirring the solution using the magnetic stirrer, change the temperature of the entire assembly and stabilized it at a particular value etc. In order to get uniform film thickness the film substrate is continuously rotated and the solution is continuously stirred using magnetic stirrer. The temperature of assembly is maintained by heating arrangement and temperature controller. The thickness of the films governed by controlling the deposition time and the concentration of the solution. [8-10]

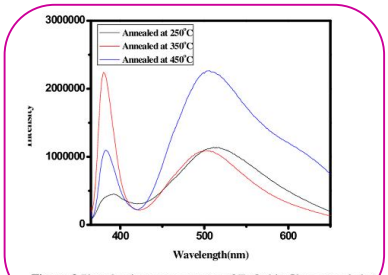


**Figure 3** Photoluminescence spectra of ZnO thin films annealed at different temperatures

The prepared samples of CdS and ZnS by chemical bath deposition were taken for annealing and kept into muffle furnaces Biotech of India of 2500 watts at 15 amperes which can withstand maximum temperature of $1000^0$c. The temperature of the furnaces was maintained at $400^0$C, $600^0$c and $750^0$C for more than 8 hours. After annealing sulfide ions converted into oxide ions by converting CdS into CdO and ZnS into ZnO. [11-14]

The prepared films of CdO and ZnO with annealing effect were taken for characterization to determine UV-VIS properties.

## RESULT AND DISCUSSION:

The Uv- Vis spectroscopy is used to determine the optical properties of annealed CdO & ZnO thin films. The ⁒ absorption of the annealed CdO & ZnO thin films was studied at 400$^0$C, 600$^0$C and 750$^0$C. From the figure 1 and it is observed that the annealed CdO (I) thin film at 400$^0$C absorbs maximum light intensity for the wavelength 300nm. The characteristic absorption peak noted at 300nm. This is a Uv-Vis region of the spectrum. With the increase in the annealing temperature there is a shift in the position of the absorption peak as seen in figure 2 and 3. From this observation it can be analyzed that there are uniform distribution of nanoparticles and most of the particles are in nano dimensions. From the figure1, 2 and 3 it can also be observed that there is no other peak observed in whole spectrums. This means that CdO is successfully formed. [15 20]

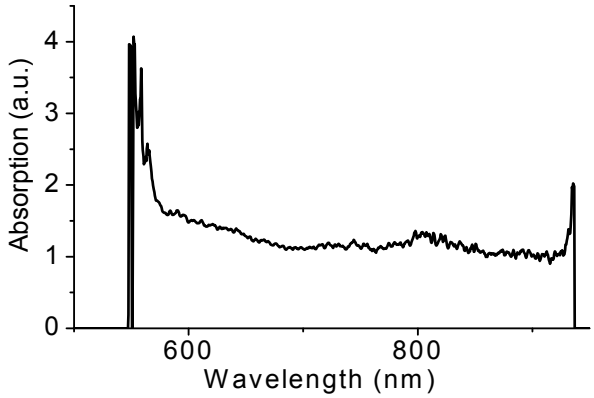


**Fig.1: Shows wavelength verses the ⁒ of absorption for CdO (I) Thin film annealed at 400$^0$C.**

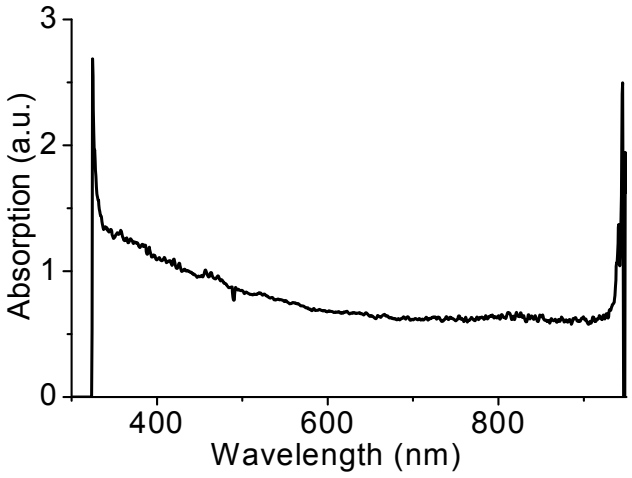


**Fig. 2: Shows variation in wavelength verses ⁒ Absorption for CdO (II) thin film annealed at 600$^0$C.**

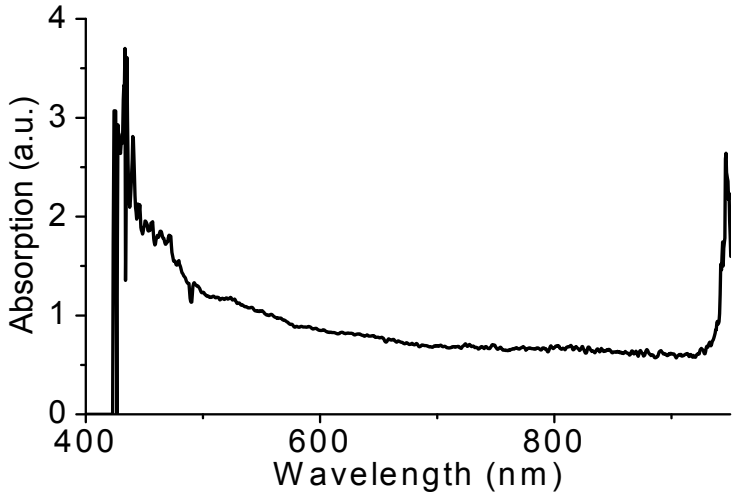


**Fig. 3: Shows variation in wavelength verses ⁒ Absorption for CdO (III) thin film annealed at 750$^0$C.**

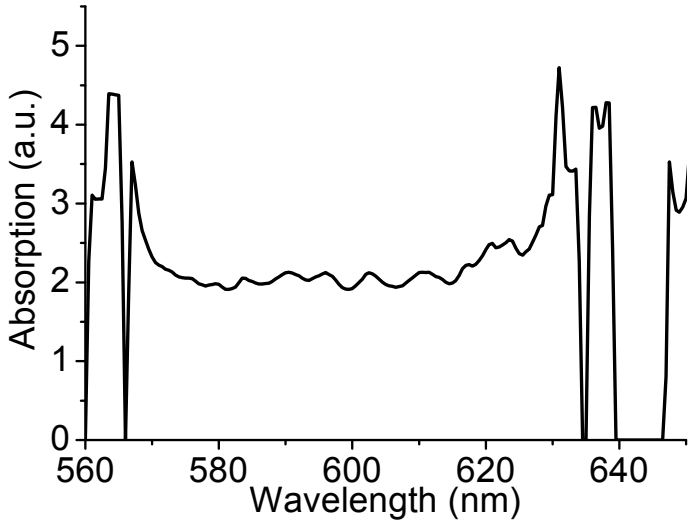


**Fig. 4: Shows variation in wavelength verses ⁒ Absorption for ZnO (I) thin film annealed at 400$^0$C.**

The absorption peak of annealed ZnO thin film at 400$^0$C, 600$^0$C and 750$^0$C is shown in figure 4, 5 and 6. From the figure 4 it can be observed that the ZnO thin film annealed at 400$^0$C shows the strong absorption in the visible region of the spectrum.[21 24] As the annealing temperature increase from 400$^0$C to 600$^0$C figure 5 and from 600$^0$C to 750$^0$C figure 6 there is a shift in the position of the absorption peak towards the shorter wavelength side in the ultraviolet region of the spectrum. This shows that annealing of the thin film improves the quality of the films. [25 30]

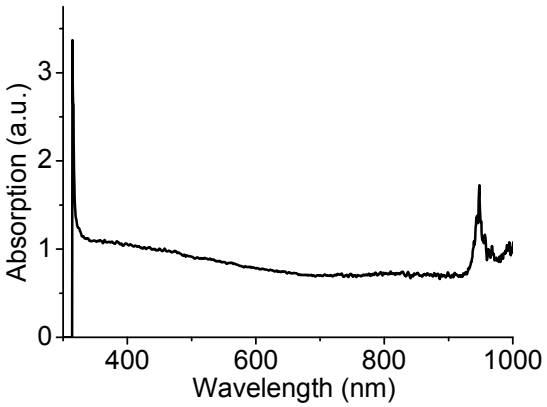


**Fig. 5: Shows variation in wavelength verses % Absorption for ZnO (II) thin film annealed at 600$^0$C.**

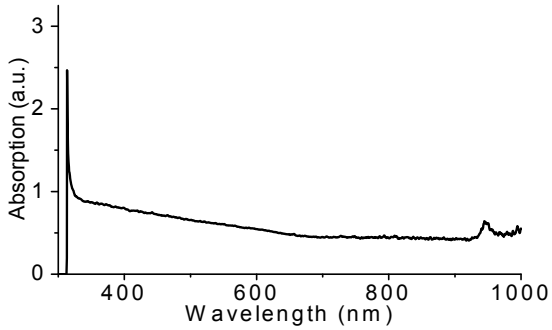


**Fig. 6: Shows variation in wavelength verses % Absorption for ZnO (III) thin film annealed at 750$^0$C.**

## CONCLUSION:

The thin film of CdO and ZnO successfully obtained by thermal annealing of CdS and ZnS. The Uv-Vis study of CdO and ZnO thin film conclude that the annealing of the thin film at the different temperature improves the quality of the films. The specific application of the material depends upon the absorption of light by the materials. It can be also conclude that CdO absorbs more light in Uv-Vis region and ZnO absorbs less light in Uv- Vis region. [31 35]

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