

MASTER'S THESIS WORK

- 1. Name of Student:** Adnan Nazir
- 2. Registration No:** 2008-NUST-MS PhD-MS-E-12
- 3. Institute:** School of Chemical and Materials Engineering (SCME).
- 4. Department/ Discipline:** Materials Engineering.
- 5. Thesis Topic:** Preparation and Characterization of II-VI Group Thin Films.
- 6. Brief Description/Abstract:**

Cadmium Sulfide (CdS) polycrystalline thin films were grown on corning glass substrate by Close Spaced Sublimation (CSS) technique. Thin films were immersed in low concentrated (0.1g/100mL) $\text{AgNO}_3\text{-H}_2\text{O}$ solution (ion-exchange process) at room temperature to get Ag-doped thin films. The structural and morphological investigations were performed by means of X-ray diffraction (XRD) technique, scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDX) and atomic force microscopy (AFM). Structural study showed that the deposited thin films exhibit a polycrystalline structure with $\langle 111 \rangle$ as preferred orientation. Optical and Electrical measurements were examined by UV-VIS/NIR spectrophotometer (Perkin Elmer Lambda 950) and Hall apparatus, respectively. The structural, optical and electrical properties of these thin films were analyzed as a function of the film thickness and Ag-concentration (mass %). The deposited thin films showed that the value of resistivity decreased with increasing thickness and Ag-concentration as well, manifesting the semi conducting behavior of thin films. The structural study showed that with increase in film thickness grain size increased but optical transmission slightly decreased.

- 7. Level of Research already carried out on the proposed Topic:**

Similar type of research work is reported in literature but the Closed space sublimation (CSS) system was developed in laboratory first time and semiconducting thin films were fabricated. Further physical properties of Silver-doped CdS thin films are discussed here and ion exchange method is used for the doping of silver.

- 8. Reasons/Justifications for Selection of the Topic:**

Nano science and thin films is an emerging field and lot of advancements is carried out these days in this field. There is a vast range of applications of semi conducting thin films such as solar cells and detectors. First step was to learn the thin film fabrication technique and various characterization methods. Then it is expected to do research in the energy sector.

9. Objective:

The aims of this work include: (1) to fabricate good thin films of CdS having different thickness (2) to study the structural, surface, optical and electrical properties against change in thickness (3) to study the effect of silver doping in physical properties of CdS thin films.

10. Relevance to National Needs:

In these days developing countries like Pakistan are facing energy crises, so we need renewable energy sources to overcome this problem. CdS is a strong candidate for CdS/CdTe thin film solar cells having good efficiency.

11. Advantages:

CSS technique is an easy and efficient method of thin films fabrication. CdS thin films fabricated by CSS technique show good properties. Doping of silver in CdS thin films decreases its resistivity.

12. Areas of Applications:

In electronic devices, electronic displays, optical coatings, thin film solar cells etc.