

The executive summary of the final report of work done on the Minor Research Project under XIIth plan of U.G.C.

Title of research project: - Transport and Optical Properties of ZnTe and ZnSe Thin Films by Thermal Evaporation Method

Name of the Principal Investigator: - Dhanvij Janardhan Vishwanathji,
Department of Physics, Smt. P.K.Kotecha Mahila
Mahavidyalaya, Bhusawal Dist. - Jalgaon (MH) Pin- 425201

UGC Reference No.:- 47-722/13(WRO), Date: 27 MAR.2014

➤ **Hall Effect Experiment Set Up (HEX 21C “SES”)**

- The set-up consists of following units:
- | |
|---|
| i] (a) Hall Probe (Ge Crystal –n type), |
| (b) Hall Probe (Ge Crystal –p type) ii] Hall Probe Multipurpose Stand, HPS |
| iii] Hall Effect Set –up, Model DHE-21C iv] Electromagnet, Model EMU-50V |
| v] Constant Current Power, DPS-50C Supply vi] Digital Gaussmeter, DGM-202C |
| vii] Computer Aided Measurement Module, SES CAMM-2, complete with suitable software |

➤ **Preparation of Compound Ingot**

The bulk sample of ZnSe and ZnTe has been prepared by melt quench method. The direct mixture of extremely pure Zn and Se and Zn and Te (purity 99.999%), in the atomic proportion 1:1 was kept back in evacuated quartz ampoule at pressure 10^{-5} torr. The mixture was sealed in an evacuated quartz tube and heated at 920°C for 12 hours, and then quenched in ice cooled water.

➤ **Summary of the Findings:**

In this present study electrical and optical properties of ZnSe and ZnTe thin films have been studied. All the films were prepared on glass substrate over thickness range of 1000 – 3000 Å by thermal evaporation technique. Conclusions drawn from the obtained results:

- From X-ray Diffractograms, it is found that, the films deposited at 303K are polycrystalline in nature. It is found that both are increased with increase in film thickness.
- The average grain sizes of ZnSe films prepared at their optimum growth condition were found to be 35 nm and for ZnTe films grain size were found to be 199 nm.
- These growth conditions and parameters were set as optimum growth conditions for preparing ZnSe and ZnTe thin films and for studying their electrical and optical properties in the present case.
- The particle size obtained from SEM for ZnSe is 40-62 nm and for ZnTe 56 - 63 nm.
- . The plot of resistivity as a function of thickness indicates that the resistivity of films increases as thickness increases.
- From the slope of the higher temperature range of $\log \rho$ versus $1000/T$ plots, it is clear that activation energy is thickness dependent.
- The plots of Hall voltage against probe current and magnetic field indicates that Hall mobility, Hall- coefficient and carrier concentrations are thickness dependent.
- The optical absorption spectra of ZnSe and ZnTe thin films for thickness 1000- 3000 Å was obtained in an UV-VIS –NIR spectrophotometer in the range 200- 1100 nm.
- The optical band gap was found to be in the range 2.6 eV - 2.8 eV and 2.0 – 2.5eV respectively for as deposited films.