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**PREPARATION AND CHARACTERISATION OF
SEMICONDUCTING MATERIALS BY ELECTRODEPOSITION**

BY

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Declaration

***I declare that the work reported in this dissertation is my own unless
specified and duly acknowledged by quotation***



Vidya Harish

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Abstract of the work done :

Thin films of Cadmium sulphide and Cadmium sulpho selenide were formed by electrodeposition using a solution of $\text{CdCl}_2 \cdot 2\frac{1}{2} \text{H}_2\text{O}$ [0.2 M], $\text{Na}_2\text{S} \cdot \frac{1}{2}\text{O}_3$ [0.1 M] and SeO_2 [0.1M] . The films were deposited on Silicon and ITO substrates which were used as one of the electrodes . Copper was used as the counter electrode in some cases and platinum was used as the counter electrode in other cases. The voltages used for deposition were of the order of 0.4 V to 0.8 V. The crystalline nature of the films deposited , was established by x-ray diffraction studies of the films. A strong line characteristic of CdS was obtained at $2\theta = 29.9^\circ$. The thickness of the films coated was measured by using optical transmission spectra. The thickness of the films was estimated to be between 400- 800 nm. The optical spectra were also used to estimate the refractive index of the material deposited. The resistivity of the films coated was studied as a function of temperature and the band gap was calculated from this data which was found to be of the order of 1.7 eV to 2.5 eV at room temperature.

The films coated were used to make solar cells and it was found that the electrodeposited CdS films on silicon substrate showed an open circuit voltage of 40 mV. Films deposited on ITO substrate gave very low open circuit voltage. If the films were deposited on silicon for time duration larger than 30 minutes giving thicker films the films were found to contain copper especially when copper counter electrode was used. The presence of copper is found to be detrimental to the good working of solar cells. Hence it was necessary to coat the films for a very short period in order to get sufficiently thin films to be able to give solar cell action. This small thickness could not be detected by XRD. Thin film depositions were also formed using CdS/CdSe hetero junctions. The optical data as well as resistivity were studied .The solar cells formed using this material on silicon substrate were found to have an open circuit voltage of 30 mV. EDAX and SEM experiments were done to ensure the presence of CdS and CdSe in a uniform distribution.

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