



ELECTRICAL PROPERTIES CdO THIN FILMS PREPARED BY SPRAY PYROLYSIS.

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Abstract.

A CdO thin film was prepared using aqueous solutions of cadmium chloride by spray pyrolysis. The substrate temperature was 350 °C. Thickness of the films was calculated by using Michelson-interferometer. Electrical resistivity calculated by Four-Probe method for the temperature range 300 °K to 600° K. The two distinct regions corresponding to low and high temperature which indicates the presence of shallows and deep traps level were found.

Keywords. Spray pyrolysis, electrical properties, thin films.

1. Introduction

Semiconductor-liquid junction solar cells are of considerable interest for solar energy conversion because they are simple in construction and have the advantage of being used for both photovoltaic and chemical energy conversion (1,2). But the problem is to find semiconductor electrode material which will be stable in an electrolyte inexpensive and simple for preparation. Cadmium oxide is a small band gap ($< 2.5\text{eV}$) semiconductor to allow efficient utilization of solar spectrum. It has absorption coefficient (3) of the order of 10^4 cm^{-1} . Cadmium sulphide and cadmium selenide compound belongs to II-VI group and are used in the variety of semiconductor devices such as solar cells, transistors, photoconductor. The large band gap semiconductor electrode such as TiO_2 , ZnO etc offer the possibilities for studies of the energy parameter of fundamental charge transfer processes.

An attempt has been made discuss the electrical properties of CdO thin films prepared by spray pyrolysis method using cadmium chloride solutions at 350°C. This method of preparing thin film is simple and inexpensive. Resistivity measurement was carried out on Four-probe method. Thickness of the films was calculated by Michelson-

interferometer. Temperature of the substrate was measured by pre-calibrated thermocouple.

2. Experimental Procedure

Aqueous solution of cadmium chloride of 0.1 M was used for spraying the films on hot glass substrate. Solution was prepared in double distilled water. The chemical used was of AR grade. Biological glass slides 1.3 mm thick were used as a substrate the spray rate was maintained as 3.5 ml/min by using compressor air machine.

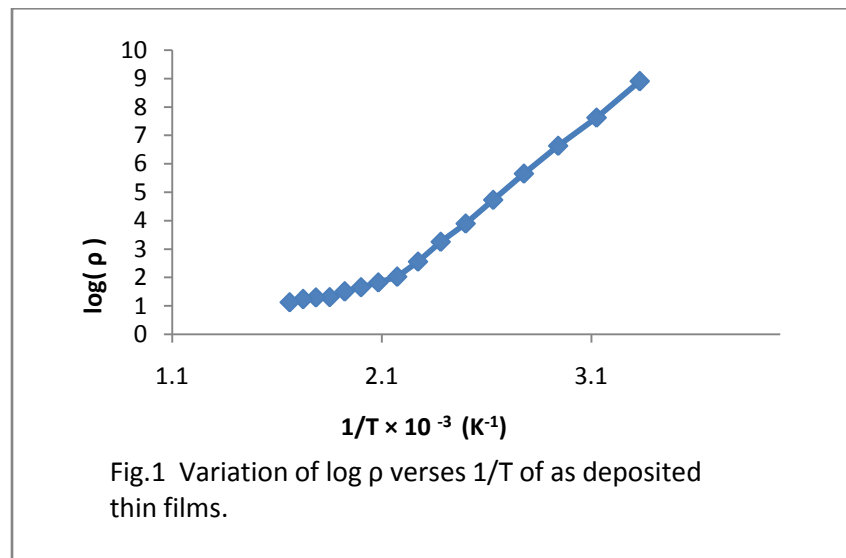
3. Resistivity Measurement

The electrical resistivity of CdO thin films with temperature was studied in the temperature range 300^o K to 600^o K by plotting the graphs log ρ versus $1/T$. The plot obeyed the following relation (5,6).

$$\rho = \rho_0 \exp (-E_a /kT) \quad 1$$

where, ρ – Resistivity, ρ_0 - pre-exponential terms,
 E_a is the activation energy, k – Boltzmann constant, T – absolute temperature.

The graph shows two distinct regions corresponding to low and high temperature regions i.e. temperature 300 ^oK to 480 ^oK and 480 ^oK to 600 ^oK. The two activation energies calculated from the slope of the plots .The activation





Energies 0.06 eV for the temperature 300 to 480 °K and 0.35 eV for the temperature 480 °K to 600 °K, which indicates the presence of shallow and deep traps levels. This result also agreed well with the result obtained by Lokhande et al (3).

4. Conclusion

The CdO thin films are prepared from the cadmium chloride solution by spray pyrolysis technique. The electrical properties of the films was studied. It has two region for the temperature 300 °K to 480 °K and 480 °K to 600 °K which shows the presence of shallow and deep traps levels.

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