

Impact of Static Magnetic Field & Varying Electromagnetic Field upon Resistance of CdS Thin Film

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In the present study we take CdS thin film of thickness $t = 0.21 \mu\text{m}$, Resistance of CdS thin film is measured in the magnetic field range 0.1T to 0.6 T with 0.1T steps and in the frequency range 2-8 MHz in the 1 MHz steps. The observed experimental data showed that resistance remain constant with change in strength of Magnetic field but it decreases as frequency of Electromagnetic field increases.

Keywords: Magnetic field, Electromagnetic field.

1. INTRODUCTION

To meet up the requirements of energy for world, solar energy is the ultimate answer, and this energy can be harvested using solar cells made by thin films of optically active materials, such as CdS. Thin films of CdS can be prepared by various methods [1] and their properties were studied [2-7] earlier. In reference to solar eruption and its effect on solar cells here we studied the effect of electromagnetic field on Hall coefficient of thin film of CdS.

2. EXPERIMENTAL

Pure CdS in powdered form was taken to produce thin film. A Hind Hivac Vacuum System (model 12A4) was employed for fabrication of thin film in the present investigation. Since here specimen was in powdered form, we used boat of quartz tube of $\frac{1}{2}$ inch depth, which was placed in cone shaped tungsten coil. Tungsten strips of 10 cm \times 0.5 cm \times 0.05 cm were taken and twisted into a cone like shape at the middle and the two ends of 2.5 cm each were left for fixing in the electrode system of vacuum unit.

Glass sheets were used as substrate after proper cleaning. Gold electrodes were formed on substrate such that film between electrodes was 4" \times 1" and of thickness 0.21 μm . The thickness of thin film was measured with Talysurf instrument (Model Talysurf 10, Taylor-Hobson). Now substrate was mounted on a wooden block and fine copper wires were adhered for the current on the film by air drying silver paint.

3. RESULT

The resistance of thin film is very high as the order of 10^6 ohm for under investigation geometrical form. The resistance of experimental CdS thin film remains constant with strength of magnetic field as shown by data in Table 1.

Table 1: Variation in resistance with magnetic field for CdS thin film.

B (Tesla)	Resistance X 10 ⁶ ohm
0.1	2.1
0.2	2.0
0.3	2.0
0.4	2.1
0.5	1.9
0.6	2.1

The resistance of experimental CdS thin film decreases with radio frequencies as shown by data in Table 2.

Table 2: Variation in resistance with radio frequencies for CdS thin film.

f (MHz)	Resistance X 10 ⁶ ohm
2	2.2
3	2.1
4	2.0
5	1.9
6	1.8
7	1.7
8	1.6

4. DISCUSSION

The above mentioned results can be explained as:-

As the applied magnetic field is in the same direction of drift velocity of charge carriers i.e. electron, hence they experience no force due to magnetic field. Hence their mobility remains unaffected. This is why the resistance does not change with magnetic field.

As the radio frequencies passes through the semiconductor, they are attenuated by charge carriers in semiconductor. So the effective mass of charge carriers decreases and mobility increases with frequencies. Hence the conductivity increases and the resistance of experimental thin film decreases with increment in radio frequencies.

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