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Study of Structural Impact on Annealed CDs Thin Films by Spray Pyrolysis Method

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ABSTRACT

A thin film of CdS is use for in the fabrication of hetero-junction solar cell. The CdS thin film deposited by spray pyrolysis technique shows the direct band gap 2.4 eV on glass substrate of different thicknesses. CdS thin films were annealed in air from 1000C about 3 hours.. The XRD reveled that the films were polycrystalline in nature and with hexagonal phase. The crysternality of the films was improved by annealing in air at 1000 C.

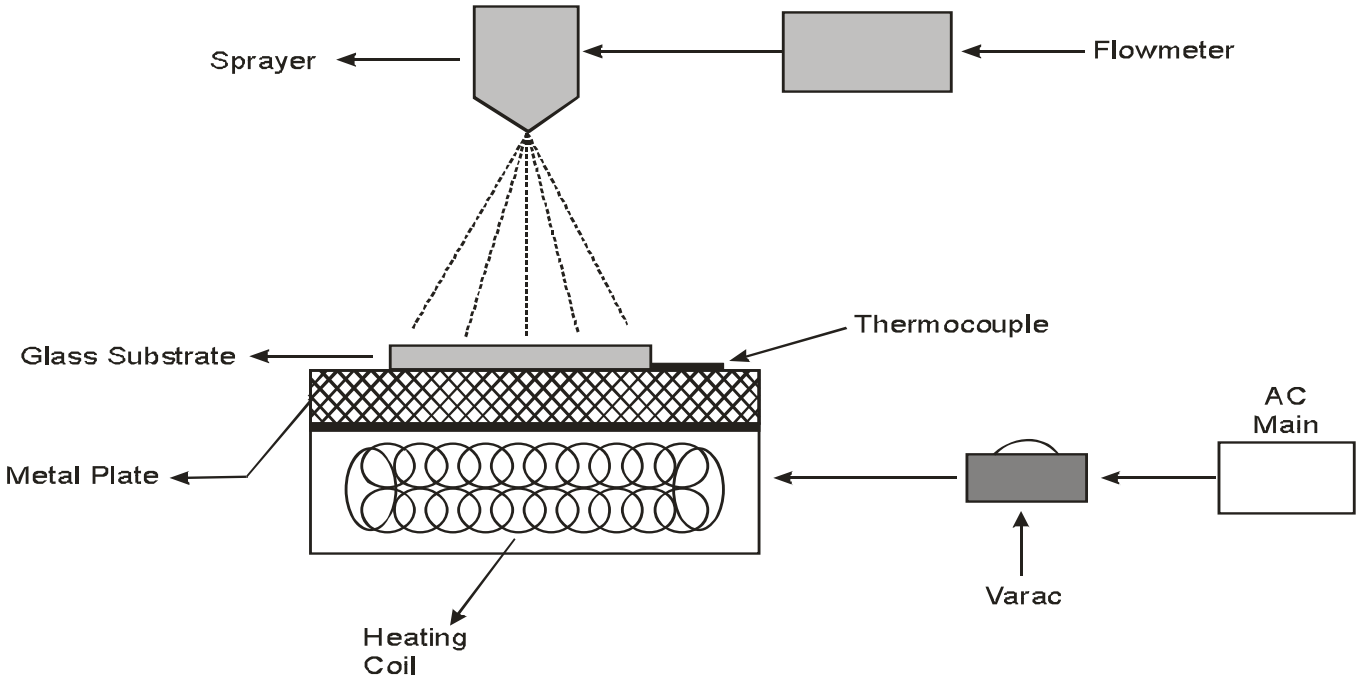
Key Words: Annealed CdS, Spray pyrolysis, XRD, thin film,

I. INTRODUCTION

At present CdS thin films area widely used as the window material in several CdS based thin films solar cells It belongs to II-VI compound semiconductor materials Thin films of CdS by spray pyrolysis. This method is simple, inexpensive and suitable for water soluble salts and films are so produced have good adherenceto moderately heated substrates The spray pyrolysis [1] is one of the most popular techniques. CdS[2]and [3]. The chemical prepared CdS films is more ideal window material solar cells. The optical energy band gap is 2.24 to 2.40 eV[4]. But the films prepared by using spray paralysis are quite few in number. In the present work, structural properties of CdS thin films annealed and unannealed of various thicknesses is studied.

II. EXPERIMENTAL DETAILS

The certain amount of pure cadmium chloride (CaCl2) and thiourea of equimolar concentration (0.01M) was used .CdS films have been produced by spraying the aqueous solution of CdCl2 and (NH2)2CS in a 1:1 (by volume) onto the microscope preheated glass substrates. the solution was thoroughly sprayed by specially designed glass sprayer on a amorphous preheated cleaned glass substrate at 350^0C .The thickness of films was determined by weighing method. The annealing of the sample was carried out in air for about 3 hours at 100. The absorption and transmission spetra of annealed and unannealed samples were recorded using Elico SL 159 UV-VIS spectrophotometer. The XRD patterns of annealed and unannealed CdS thin films were recorded with Phillips X-ray diffractometer.



III. RESULT & DISCUSSION

The CdS films were deposit using pyrolysis method containing various thickness. The film deposited by eqimolar concentration of cadmium chloride and thiourea found to have uniformity and adhesion characteristic and the film thickness depends on amount of solutions sprayed.The semiconductor band gap Eg was determined by analysis the optical data

Energy band gap (Eg) of materials is related to absorption coefficient α as

$$\alpha = \frac{A}{h\nu}(h\nu - Eg)^{1/2} \quad \ldots\ldots\ldots\ldots\ldots\ldots(1)$$

where A is constant , ν is incident photon energy, h is the Plank's constant and Eg is band gap.

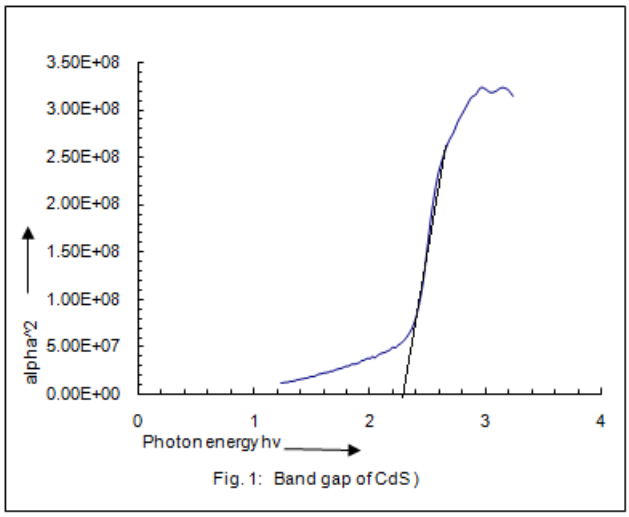
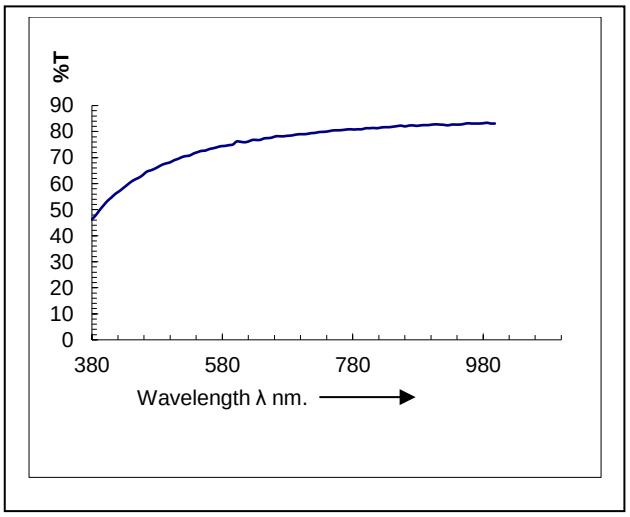


Fig. 1: Band gap of CdS)



A plot of $(\alpha h\nu)^2$ Vs $(h\nu)$ in shown in fig. (1) for different thickness gives fairly good straight line. The band gap Eg was 2.4 eV.[5].

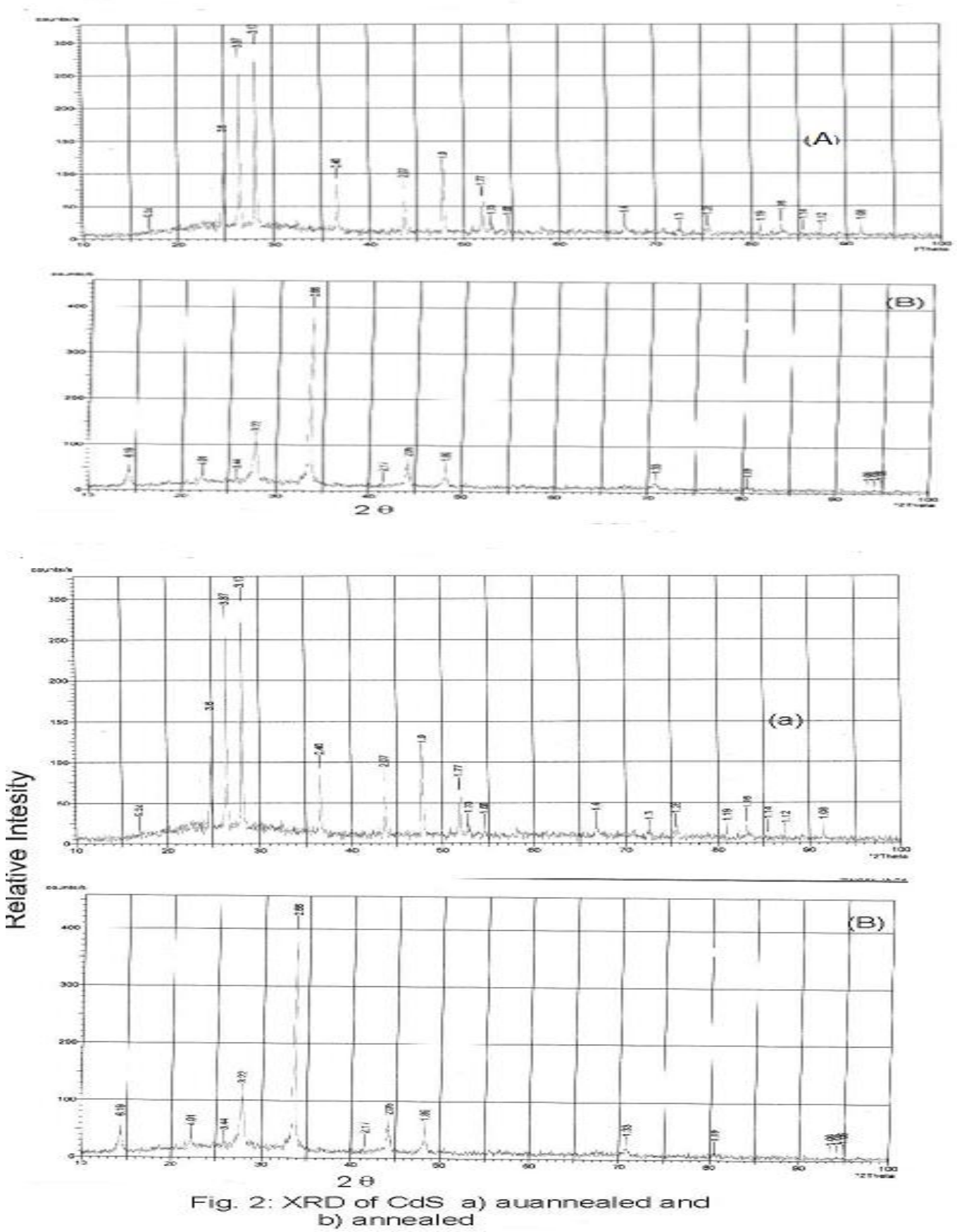


Fig. 2: XRD of CdS a) auannealed and b) annealed

Fig. (2) shows XRD, XRD was used to confirm the crystal structure of CdS thin film annealed for about 3 hours in air The crystanality incases with annealing [6]

IV. CONCLUSION

The structural properties of films were studied as a function of substrate tempreture, molarity of solution. The range of band gap is 2.35 – 2.4 eV. The CdS thin film prepared by pyrolisis have good adherence and thickness uniformity after annealed. The film is polycrystalline in nature The crystanality incases with annealing of CdS thin film. Hence these films are best suited for solar cell applications.

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