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X-RayDifferectionof Multilayer CdS/Polyaniline Thin Films

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Abstract
In the present investigation, the films of Cadmium Sulphide and Polyaniline have been prepared by vacuum Evaporation Technique. The growth and characterization of single layer and multilayer films have been done. In this paper, the study of X-Ray diffraction of multilayer CdS/Polyaniline thin films has been done.

1.Introduction

The sulphide semiconductors are one of the most extensively semiconductor in thin film form and a large variety of deposition techniques have been utilized to obtain solar cells. The Cadmium sulphide films grown by vacuum evaporation technique has been used as gas sensors for detection of oxygen and with a direct band gap it serve as a window material for heterojunction solar cells.

Sharma, et al, showed that CdS /polyaniline composite thin films can form tunable band gap heterostructure with vacuum evaporation CdS thin film on to glass substrate.

Jayachandran, et al, prepared Polyaniline layers onto porous structure by in-situ electrode position and showed photoluminescence at room temperature with a maximum current density 20 mA/Cm2, a possibility of polyaniline as ohmic contact.

Schlamp, et al, demonstrated improved efficiency in LED's made with CdS and CdSe core / shell type nanocrystal incorporated in semiconducting polymers.

Ad vincula, et al,reported improvement in performance of LED's which incorporated polyaniline coated on to ITO glass polyelectrolyte layer for heterostructure.

Foster et al, prepared the polycrystalline CdS films and found that the structural, electrical and optical properties of vacuum coated thin films of Cadmium Sulphide are very sensitive to the deposition conditions e.g. the degree of vacuum, the rate of deposition, the substrate temperature and the subsequent heat treatment. He also found that the CdS films have excess of Cadmium owing to the dissociation of CdS during evaporation, and concluded that the stoichiometry can be restored by codepositingSulphur together with CdS.

2.Sample Preparation of CDS

Thin films of CdS have been prepared by vacuum deposition technique. For sample preparation Cadmium Sulphide powder of 99.99%. purity was evaporated at about 115°C from a deep narrow mouthed molybdenum boat. Deposition was made on to highly cleaned glass substrate held at 200°C in a vacuum of 10^{-5}torr. The substrate was cleaned in aquaregia washed in distilled water and isopropyl alcohol (IPA). We have used glass substrate for the preparation of Cadmium Sulphide.

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3.Sample Preparation of Poly aniline

Thin film of polyaniline have been prepared by vacuum evaporation technique, polyaniline is usually prepared by redox polymerization of aniline using ammonium perdisulphate, $(NH4)_2\ S_2O_2$ as on oxidant. Distilled aniline (0.02 M) is dissolved in 300 ml of pre-cooled HC1 (l.0M) solution, maintained at 0-50°C. A calculated amount of ammonium perdisulphate, (0.05M) dissolved in 200 ml of HCl (1M), pre-coated to 0-50° C, is added to the above solution. The dark green precipitate (ppt) resulting from this reaction is washed with HC1 (l.OM) uptil the green colour disappears. This ppt is further extracted with terta-hydofuran and NMP (N-Methyl Pyrolidinone) solution by soxhelf extraction and dried to yield the emeraldine salt. Emeraldine base can be obtained by heating the emeraldine salt with ammonia solution. Simultaneously, separate salt solution is prepared by dissolving the MX (M=Metal and X=Halide) in distilled water. The solution is then slowly added to the precooled polymer solution with constant stirring. The composite is then dried in an oven, at high temperature, to get the conducting polymer in the powder form. This powder is vacuum evaporated on to highly cleaned glass substrate as well as metallic substrate.

4. X-Ray Diffraction

The X-ray-diffraction of the sample gives the valuable information about the nature and structure of the film.The X-ray diffractogram of different samples have been used to characterize the sample of vacuum deposited CdS on glass and Pani on to same CdS/Glass as shown in fig. (1) and fig. (2). of the sample CdS/Glass indicates the amorphosity of the film with occasional crystallization.

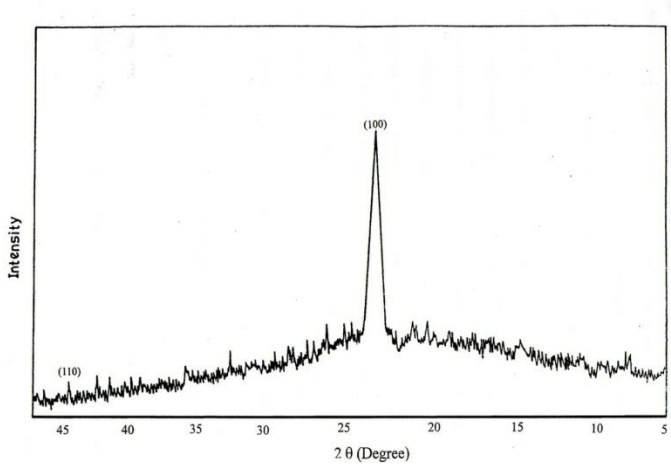

Fig.1 X-Ray diffraction pattern of CdS/Glass thin films

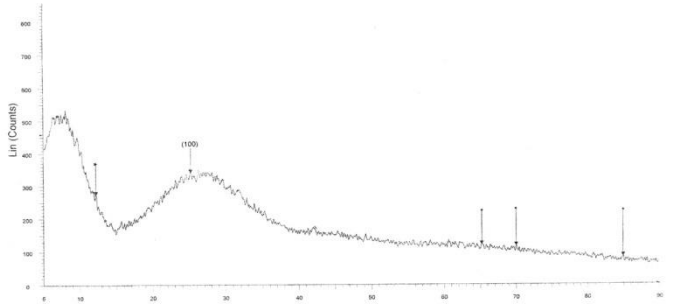

Fig.2 X-Ray diffraction pattern of Pani/CdS/Glass multilayer thin films

5. Result and Discussion

In the present work the thin film of CdS has a high degree of preferred crystallographic orientation. The sample of CdS on glass substrate exhibits preferred orientation correspond to (100) reflection, while in case of Pani/CdS/Glass, the preferred orientation with The X-R-D of the sample gives the valuable information about the nature and structure of the film. The X-R-D pattern indicates the preferred orientation which is important part in structural characterization. Hexagonal wurtzitestructure.The XRD pattern of CdS on glass indicates the amorphosity of the film with occasional crystallization.

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