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EFFECT OF MOLARITY ON PbS THIN FILMS BY CBD TECHNIQUE

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Abstract: PbS (Lead Acetate) thin films are prepared on microscopic grade glass by Chemical Bath Deposition (CBD) technique. The molarity of PbS is varied from 0.6M to 1.2M in the steps of 0.2M. Its effect was characterized by XRD and optical property i.e. reflection was carried out. The results are discussed and it is concluded that the films are becoming high reflective with increase in molarities**.**

Keywords: CBD technique, PbS thin films, reflection coefficient

1. INTRODUCTION

PbS thin films were grown on glass substrate by CBD method. It is an important IV-VI semiconductor material with technological application [1]. Different methods have been used to synthesize PbS which includes chemical bathdeposition (CBD) [2,3], spray pyrolysis [4], chemical vapour deposition (CVD)[5] and electrodeposition [6]. Among these methods CBD isthe suitable for deposition of PbS thin films as it is very simple, inexpensive convenient for large area deposition and capable of yield good quality thin films. Now a days CBD is used in film deposition technique as it does not require much sophisticated instrument to make a thin film. CBD method requires lower temperature to synthesize thin film of good quality [7]. In the present paper, we report the preparation of PbS thin films by CBD method at various molarities of lead acetate by keeping other chemicals constant and the effect of this variation on the structural and optical properties of the thin films.

2. EXPERIMENTAL

There are main 3 chemical deposition techniques that are Spray pyrolysis, Spin coating & Chemical Bath Deposition. Out of above this technique CBD is one of the inexpensive methods to deposit thin film and nonmaterial. This method is also called as solution growth method. This method is simple andcoherent for large area precipitation of thin film.

This technique works at very low temperature(below 100˚c).

Initially Lead Acetate of 0.6M to 1.2M was prepared & then it was varied in the steps of 0.2M. Thiourea (2M), NaOH (2M) and Triethnolamine (1M) were the other reagents that were used for deposition. The linearly grown films were preparedon the glass substrate. The XRD of prepared thin films was carried out by Cu Kαradiation in the range 20˚-80˚.Reflection and Transmission coefficient are measured by using He-Ne laser of intensity 800Lux with the help of lux meter.

Average particle size is measured with the help ofD=$(0.94\lambda / \beta cos\theta)$ formula, where symbols havetheir standard meaning.

Table 2.1: Preparation of molar solution

Lead Acetate	Thiourea	NaOH	Triethanolamine	Temp °c	Time min
0.6M	2M	2M	1M	60	60
0.8M	2M	2M	1M	60	60
1.0M	2M	2M	1M	60	60
1.2M	2M	2M	1M	60	60

3. RESULTS AND DISCUSSION

Following figure shows the XRD pattern of thin film grown on the glass substrate.

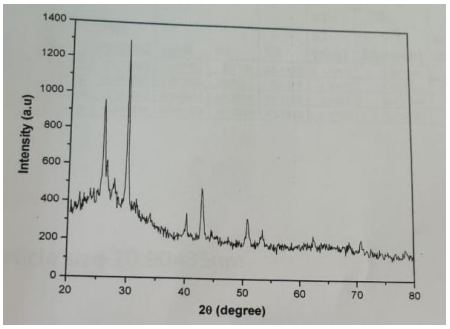

Fig.3.1: XRD Graph

The prominent peaks were identified and from the data the average crystalline size was calculated andit was found to be 20.90435nm. Also it was noticedthat there is no significant relation between crystalline size and change in molarity.

Following figure 3.2 shows the graph of reflection coefficient with change in molarity. It is clear from the graph that reflection coefficient is increasing with increase in molarity of PbS. The table 3.1 depicts other two coefficients. It shows that transmission coefficient is also increasing with increasing molarity. Absorption coefficient is decreasing with increasing percentage.

4. CONCLUSION

The PbS films are successfully deposited by CBD technique with different molarities. It is concluded that due to deposition of PbS, the films are becoming highly reflective and transmittive. Also average crystalline size of thin film is 20.90435nm**.**

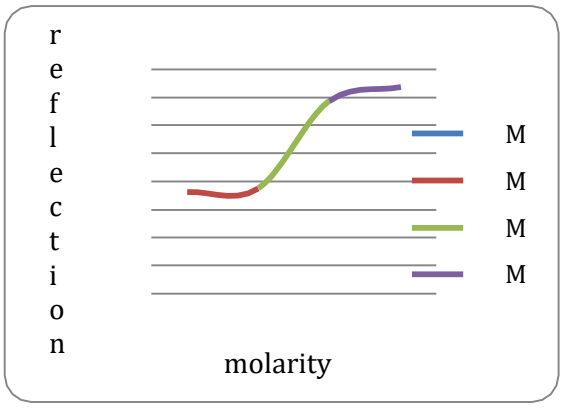

Fig 3.2: Reflection Vs Molarity

graphTable 3.1: Optical properties

Molarity	Transmission in %	Reflection in%	Absorption in%	Crystalline size (D)nm
0.6 M	3.75	36.25	60	18.9799
0.7 M	5	37.5	57.5	25.14753
0.8 M	6.25	68.75	25	20.95736
0.9 M	7.5	73.75	18.75	18.53261

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