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PROJECT NAME: Synthesis & properties of PbS thin film by Chemical bath deposition method

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INTRODUCTION

There are number of types of thin film devices. This technology used extensively in optical devices & semiconductors, through there are other application.

In the field of optics, the thin film devices used are in the form of various optical filters. These filters are commonly used in photography, telescopes and microscopes. Different types of thin films are designed to change the properties of the light passing through it.

A semiconductor is another possible type of thin film device. These devices conduct low level of electric current. Thin film semiconductor can be made out of different materials which determine the amount and level of current that the device conducts. Devices such as these are used in the field of microelectronics and integrated circuits. The film deposition techniques have been hardly classified into two main categories,

- Physical vapor deposition
- •Chemical deposition technique

CHEMICAL BATH DEPOSITION TECHNIQUE:-

The chemical bath deposition is the chemical liquid phase which is one of the cheapest methods to deposit thin film and nonmaterial's, as it does not depends on expensive equipment and is scalable technique that can be employed for large area batch processing or continuous deposition.

The equipment required for this

- Chemical bath
- Magnetic stirrer
- Thermometer
- Substrate holder
- Magnetic needle

WHY PBS SELECTED?

The PbS is a semiconductor whose band gap is 0.37 to 0.41 eV with increase in temperature.

There is no requirement of spray pyrolysis & vacuum system.

The solution required for deposition of PbS thin film are Lead Acetate ,Thiourea,Triethalomine (TEA), Sodium Hydroxide(NaOH) which were easily available & had low cost. The time required for deposition of PbS thin Film is also less as compared with other material.

Molecular formula: PbS Molar Mass:239.30g/mol Melting point : 1118°C Crystal structure: Cubic

EXPERIMENTAL DETAILS:

•Apparatus:

- Magnetic Stirrer
- Glass substrate Holder
- •Thermometer
- •Temperature Control Knob
- •RPM Control knob

•Chemicals:

- Lead acetate Pb(CH3CO)
- Thiourea(CS(NH2)2)
- Sodium hydroxide(NaOH)
- Triethanomine(C6H15NO3)

Preparation of solution:-

For preparing a solution in following formula are used:

X= molarity×Molecular weight×Volume

1000

PROCESS:

PBS THIN FILM BY CHEMICAL BATH DEPOSITION





PROPERTIES

STRUCTURAL PROPERTY

Thickness: The thickness can be obtained from volumetric (volume, density)

Molarity(M)	Ms+f(g)	Ms(g)	M(g)	L(cm)	B(cm)	P(g/cm)	Thickness (µm)
0.4	5.020	5.00	0.020	4	2.3	0.4347	50
0.8	5.300	5.00	0.300	4	2.3	6.25	52



OPTICAL PROPERTIES



Fig. Specular reflectance and transmittance of a laser beam

Molarity(M)	Angle of	Angle of	Observation
	incidence	reflectance	
0	30°	30°	Transmitted at 30°
	60°	60°	Transmitted at 60°
0.4	30°	25°	Transmitted at 25°
	60°	54°	Transmitted at 54°
0.8	30°	29°	Partially transmitted at
	60°	58°	29°
			Partially transmitted at
			58°

APPLICATIONS OF PBS THIN FILM:-

≻PbS is sensitive at room temperature.

≻Temperature control of satellite devices.

≻Sun Glass coating.

≻Solid state lasers.

≻Tunable near infrared detectors.

>Electroluminescent devices such as organic - inorganic

bulk hybrid solar cell.

≻At room temp. PbS is sensitive to radiation at wavelength(1-2.5µm)

RESULT AND CONCLUSION:-

- •By using chemical bath deposition technique (CBD) PbS thin film successfully deposited on a glass plate.
- •The film formed is compact, uniform and well adherent on glass substrate.
- •Deposition of film is more at high molarity and deposition is minimum at low molarity.
- •It concludes that the angle of transmission is decreases as molarity of thin film increases.
- •It is observed that thickness of Pbs thin film increases as molarity increases.

REFERENCES:-

- •Nanotechnology and its application
- •By Sulabha K. Kulkarni.
- Semiconductor Electronics
- A. K. SHARMA

THANK YOU