A

RESEARCH PROPOSAL

ON

SYNTHESIS AND CHARACTERIZATION OF THIN FILMS METALS (COPPER, INDIUM TIN AND CADMIUM SULPHATE)

I) INTRODUCTION :

THIN FILM

Thin film deposition is the technology of applying very thin film o f material- between a few nanometers to about 100 micrometers, or the thickness of few atoms – onto a substrate surface to be coated, or onto a previously deposited coating to form layers. Thin film deposition is divided into two categories-chemical deposition and physical vapor deposition coating system.

Chemical deposition is when a volatile fluid precursor produces a chemical change on a surface leaving a chemically deposited coating. One example is chemical vapour deposition used to produce the highest purity, highest – performance solid materials in the semiconductor industry.

Physical vapor deposition refers to a wide range of technologies where material is released from a source and deposited on a substrate using mechanical or thermodynamic processes. Physical method covers the deposition techniques which depend on the evaporation or ejection of the material from a source, i.e. evaporation or sputtering. The two most common techniques of physical vapor deposition on PVD are thermal evaporation and sputtering.

Thin film materials have been widely used in semiconductor devices, wireless communications, telecommunications, integrated circuits, rectifiers, transistors, solar cells, light-emitting diodes, photoconductors, light crystal displays, magneto-optic memories, audio and video systems, compact discs, electro-optic coatings, memories, multilayer capacitors, flat-panel displays, smart windows, computer chips, lithography, micro electromechanical systems (MEMS), and multifunctional emerging coatings, as well as other emerging cutting technologies.

II) APPLICATION OF THIN FILMS :

i) Thin -film photovoltaic cells

Thin-film technologies are also being developed as a means of substantially reducing the cells. Thin film solar cells are cheaper to manufacture owing to their reduced material costs, energy costs, handling costs and capital costs. This is especially represented in the use of printed electronics processes**.**

ii) Thin –film batteries

Thin –film printinf technology is being used to apply solid-state lithium polymers to a variety of substrates to create unique batteries for specialized applications. Thin-film batteries can be deposited directly onto chips or chip packages in any shape or size. Flexible batteries can be made by printing onto plastic thin metal foil, or paper**.**

III) Motivation

Nano dots based on metal selenides have been extensively used for their distinctive spectra properties. Copper selenide is a thermoelectric material used in a number of industrial applications including infrared detection and imaging. Indium selenide based technology provides the most efficient solar energy conversion among all thin-film photovoltaic devices. Tin selenides used for optoelectronic devices, solar cells, memory switching devices, and anodes for lithium-ion batteries.

IV) Objectives

- To prepare thin films of cadmium sulphate by spin coating unit.
- To prepare thin films of Copper Selenide, Indium Selende, and Tin Selenide by thermal evaporation method.
- To study the thin films of the materials composites as follows:
  - Structural properties by XRD measurement.
  - Surface morphology study by SEM, TEM, & AFM.
  - Composition check by X-ray photoelectron spectroscopy (XPS), Raman spectroscopy.
  - Optical properties by Ultraviolet-visible spectroscopy.
  - Electrical measurement by four probe method.

V) RESEARCH METHODOLOGY

❖ THIN FILM DEPOSITION

Thin film deposition can be achieved through two methods: Physical Vapor Deposition (PVD) and Chemical Vapor Deposition (CVD).

❖ NANOMATERIAL CHARACTERIZATION BY MICROSCOPY:

- ✓ Scanning electron microscopy (SEM)
- ✓ Energy dispersive x-ray analysis (EDX)
- ✓ Transmission electron microscopy (TEM)
- ✓ Atomic force microscope (AFM)
- ✓

❖ NANO MATERIALS CHARACTERIZATION BY SPECTROSCOPY:

- ✓ Raman spectroscopy
- ✓ Ultraviolet visible (UV-VIS) spectroscopy
- ✓ X-Ray diffraction (XRD)
- ✓ X-Ray photoelectron spectroscopy (XPS)
- ✓ Fourier transform electron spectroscopy (FTIR)
- ✓ Four probe method.

VI) RESEARCH WORK PLAN:

1. First three months we will do literature survey and then we will learn how to make thin film by spin goating technique.
2. Next three months we will deposite thin film of cadmium sulphate, copper selenide and Tin selenide and another three months we will do characterization by SEM, TEM, XRD, AFM, FTIR, RAMAN, UV-VIS and XPS.
3. We will prepare research papers to send them for publication in conferences and journal at national and international level**.**

VII) REFERNCES:

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