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CHARACTERISATION OF MANGANESE DOPED CdO THIN FILMS PREPARED BY DIP COATING METHOD

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Abstract: **Transporant and conducting cadimum oxide (CdO)and maganese doped cdo (Mn:CdO) thin films were deposited using a low cost dip coating method on the glass substrate at 400˚C. For Mn doping concentration of magnanese choloride 2% (0.039582gm) was used in the spraying precursor solution. The CdO and Mn film were investigated using uv-vis spectroscopy ,FTIR spectroscopy and thickness measurement.The optical band gap of the films decreases from 5.69 eV with increasing concentration of maganese, Optical absorption spectra of Cdo film decreases with increases doping concentration of maganese. The FTIR study reveals that the CdO and Mn the functional groups are presented. The Airwedge method of CdO and Mn: the thickness of the thin films to increases with CdO doping percentage from pure CdO 1.2504×10^{-3}mm at 0.1% Mn 4.1344×10^{-3}mm. It is observed that the Mn doped CdO is higher than the pure CdO.**

Keywords: **Cadimium oxide; dip coating;UV;FTIR and Airwedge.**

1. INTRODUCTION

Introduction to Experimental Method:

Transporant and conducting in the form of thin films has been used in applications such as photodiodes, phototransistors, photovoltaic cells, transparent electrodes, liquid crystal displays, IR detectors, and anti reflection coatings. CdO microparticles undergo bandgap excitation when exposed to UV-A light and is also selective in phenol photo degradation.

This application of the material is used to cadmium plating baths, electrodes for storage batteries, cadmium salts, and catalyst. It is also available in pellets, pieces, powder, sputtering targets, tablets, and nanopowder. Cadmium oxide (CdO) is an inorganic compound; It has crystallizes in a cubic rocksalt at different temperatures. Their various fabrication techniques, the dip coating is mostly used method of preparing Transparent oxide thin films.

The hope of this preparation is to find, the evaluate of the layer on the surface bonding and Airwedge method is used to calculated the thickness of the coating film is compared to ordinary film.

2. METHOD OF PREPARATION

In the present work, Cadmium oxide (CdO) thin films were prepared on glass substrates by sol-gel dip coating technique. In a beaker, 0.1M of cadmium oxide was dissolved in 50 ml of deionized water. The solution was continuously stirred by a magnetic stirrer for 1hour to get a clear homogeneous solution. Then 2% (0.039582gm) of manganese chloride is added and stirred few seconds then Ammonium hydroxide ($NH_3.H_2O$) solution was added drop wise till the pH is reached 12. The Mn doped CdO thin film was prepared.

This solution is taken in small beakers and the glass substrates were dipped into beakers for 24 hours. The glass slides were dried in room temperature. These slides are annealed at 400˚C and used for the characterization techniques. The annealed films were studied for their surface bonding and thickness Properties.

3. RESULT AND DISCUSSION

UV Spectroscopic Studies

The absorption spectra in the wavelength region of 100nm- 600nm for the Mn. CdO of different concentration (0.1M) deposited on glass substrates at annealing temperature 400°C were studied. It is observed that the absorbance increases with doping concentration of precursor solution. The absorbance spectrum of Mn dopped CdO thin films are shown in fig. It is clear that as the concentration increases, the absorbance of the film is also increase. The band gap energy value for the Mn. CdO was further increased.

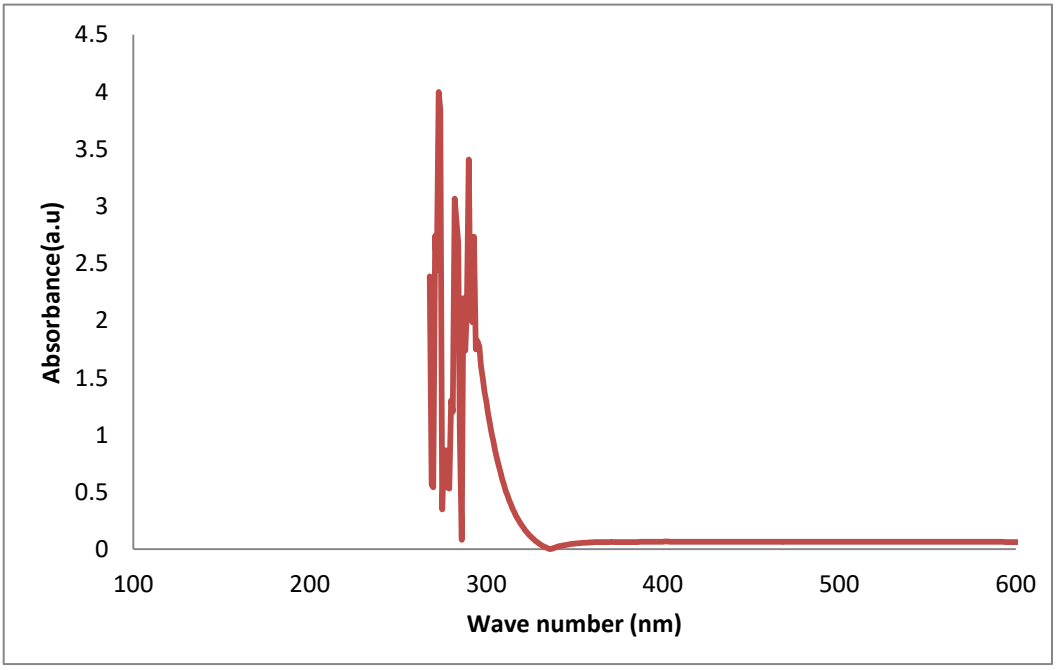

Figure 1. UV Spectrum of Mn. CdO thin films

The band gap is calculated using the formula is given by,

$$E_g = \frac{hc}{\lambda} \text{ eV}$$

Where, h is the planck's constant h=6.626×10^{-34}m/s and c is the velocity of light c=3×10^{8}m/s, ƛ is the calculated wavelength of the Spectrum in eV.

The wavelength and band gap energy is compared with pure cadimium oxide and maganese doped cadimum oxide. As the concentration percentage is increased band gap energy is increased.

Material	Wavelength (ƛ) nm	Bandgap(Eg)
Pure CdO	340	3.65 eV
Mn.cdo	320	3.88 eV

The Ultra – Violet visible spectroscopy studies show that the Mn doped band gap energy 3.88 eV. The few amount of doping concentration the band gap energy is decreased.

FTIR Spectral studies

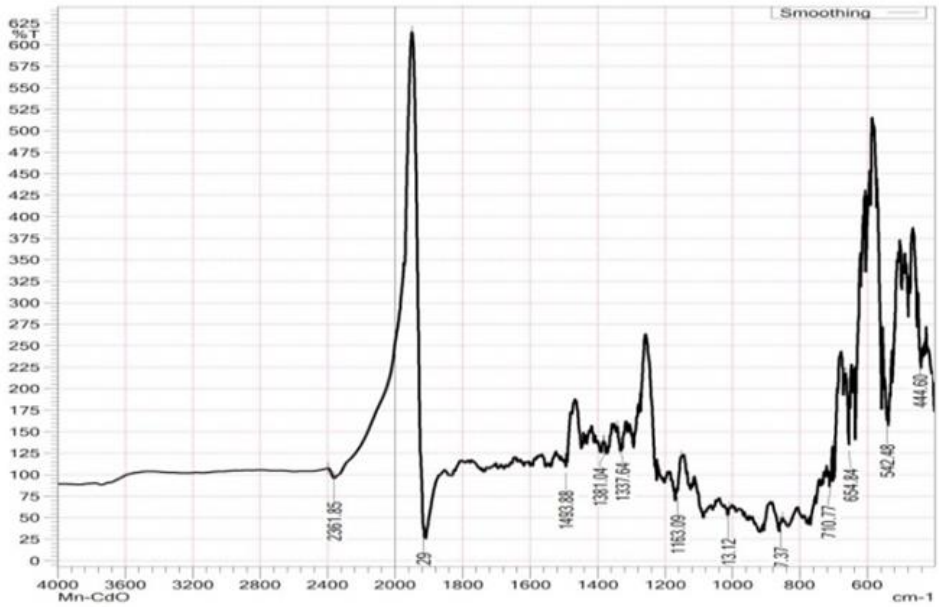

Figure 2. FITR Spectrum of Mn doped CdO thin films

Figure 2 shows the Fourier Infrared Spectroscopy of the Mn doped CdO films. The obtained FTIR spectrum of Mn dopping CdO thin film with p^H 12 and annealing temperature at 400°C is shown in fig. The absorption peak at 1916.29 cm^{-1} is assigned to strong-medium and Asymmetric C=C=C Stretching Vibration.

A band pointed at 1163.09 cm^{-1} is assigned to strong O-H deformation and C-O Stretching Vibrationc interaction. The band observed at 710.77 cm^{-1} is assigned to strong N-H Deformation Vibration. The band at 1013.12 cm^{-1} is assigned to strong C-O Stretching Vibration. A band observed at 542.48 cm^{-1} is assigned to strong C-C-C Stertching vibration.

Thickness measurement using Air Wedge method

The air wedge glass plates and the thin film samples, sodium vapour lamp and stand were used in this experiment. Using air wedge microscope the thickness of the samples is measured and tabulated in table 5.7.1.

It consisted of a sodium vapour lamp set, air wedge microscope and 45° turning glass plate. Using this air wedge setup, thickness of pure CdO and Manganese doped CdO thin films were studied.

The thickness of thin films seemed to increases with Manganese doping percentage 0.1%.

Thin film materials	Thickness (nm)×10^{-3}
Pure CdO	1.2504
Mn.CdO	6.866

It is observed that the thickness of the Mn doped CdO is higher than pure CdO.

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