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STUDY ON OPTICAL AND STRUCTURAL PROPERTIES OF CHEMICAL BATH DEPOSITED ZNS THIN FILMS

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Abstract: *ZnS thin films were deposited on optical glass plate by chemical bath deposition method from solutions containing thiourea, zinc acetate and ammonia solution. The optical properties of prepared thin films were investigates by UV-visible transmission spectroscopy. The effects of growth conditions such as reagent concentration and deposition technique on optical and structural properties of ZnS thin films have been discussed.*

Keywords: *ZnS Film, Chemical Bath, Structural properties*

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INTRODUCTION

ZnS thin films were prepared on glass plate using CBD. ZnS thin films wide band gap and n-type conductivity are promising for electronic device application such as photovoltaic cells. ZnS thin films are important semiconductor material. It is used thin films coating optical and microelectronic industries. ZnS thin films have also been widely studied due to their employment in an antireflection coating for heterojunction solar cell [(1),] for light emitting diode [(2,3)] and other optoelectronic device such as blue and green emitting laser diode[(4)], electro luminescence device and photovoltaic cells which enable wide application in the field of display [(5,6)], sensors and lasers [(7)] there has been growing interest in developing technique for preparing semiconductor nano particles and films. There are various techniques to prepare thin films such as molecular beam epitaxy, pulsed electro chemical deposition, sputtering, vapour phase epitaxy. Chemical bath deposition has been employed to prepare ZnS thin films. The structural and optical properties of the deposition ZnS thin films were studied.

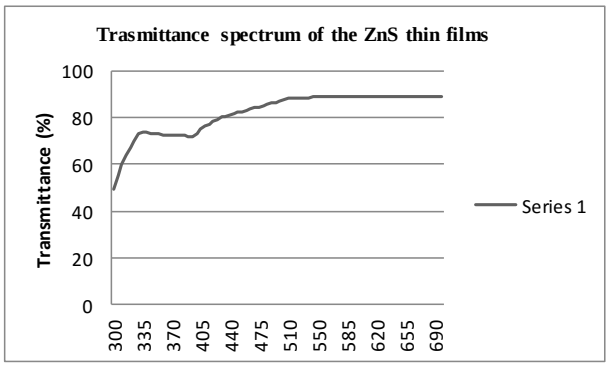
Materials and Methods

The deposition of films was carried out by using glass plate as substrates. Which were initially boiled in concentrated chromic acid for 30 minutes, rinsed in acetone then double de- ionized water and finally ultrasonically cleaned all analytical grade (A.R) reagents were used as it is without further purification. For deposition of ZnS thin films aqueous solution of 0. 2M Zinc acetate, 0.6M thiourea and complexing agent 25 % aqueous ammonia were used.

The experimental arrangement consists of a special substrate holder which is attached to motor having a constant speed of 60 rpm. The temperature of chemical bath was adjusted with a hot plate and a temperature controller ($\pm 5^0$c), while magnetic stirrer is applied to promote ion by ion heterogeneous growth on the substrate. The pH value of working solution was adjusted by a pH meter above 8 for different deposition time. The deposition process is based on the slow release of Zn^{2+} and S^{2-} ions in solution which then condense on substrate. The deposition ZnS occurs when the ionic product of Zn^{2+} and S^{2-} exceeds the solubility product of ZnS.

1.1 Optical properties of ZnS thin films

The ZnS thin films are prepared by CBD on glass substrate. (Fig1); shows transmittance spectra for ZnS thin films. The transmittance of ZnS thin films about 82.20% in the range of wave length 300 nm to 700 nm. The transmittance spectrum above range of wavelength 500nm is nearly constant[8].This shows that ZnS thin films with high transmittance were prepared by CBD method.

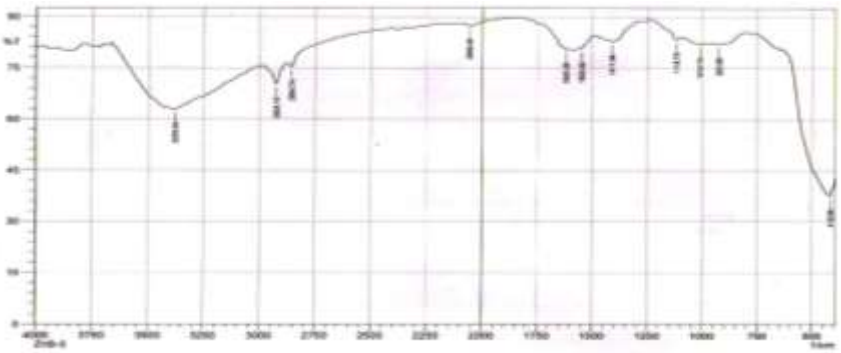


(Fig. 1): Shows transmittance spectra for ZnS thin films

1.2 Fourier Transform Infrared (FT-IR) study of ZnS thin films

The FTIR spectra of ZnS thin films on the glass substrate are represented in figure 2;the spectrum has been recorded in the region 400-4000 cm^{-1} the vibrational frequencies of the various chemical bonds in the films can be assigned from FTIR spectra in terms of peak position by the assignments of stretching and banding modes of vibrations to be observed frequencies conformational preference at since the FTIR Spectrum has been taken in the range 400-4000 cm^{-1} the presence of the chemical constituents cannot be identified using the FTIR spectrum

The FTIR Spectrum of ZnS Thin films have been recorded on SHIMADZU (Japan) FTIR spectrometer the IR Frequencies along with the vibrational assignments of ZnS nano particles. The absorption peaks observed at 3379.40 cm^{-1} are attributed to O–H stretching vibrations of water molecules and bending vibration at 1620.26 cm^{-1} has been observed in ZnS thin films as reported earlier[9] The peaks at 2924.18 cm^{-1} and 2854 cm^{-1} are owing to C–H stretching vibrations the stretching at 2060.04 cm^{-1}owing to N=N vibrations. The 1550.82 cm^{-1} 1411.94 $cm^{-1}$are due to ZnO as reported[11,12]. The observed peak at 650 $cm^{-1}$and 675 $cm^{-1}$are medium to strong bands which have been assigned to ZnS Stretching [10]



(Fig. 2): FT-IR spectra of ZnS thin films.

CONCLUSION;

ZnS thin films have been deposited using CBD method The transmittance of ZnS thin films about 82.20% in the range of wave length 300 nm to 700 nm. The transmittance spectrum above range of wavelength 500nm is nearly constant.FTIR spectrum is applicable confirm the presence of constituents qualitatively or quantitatively.

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