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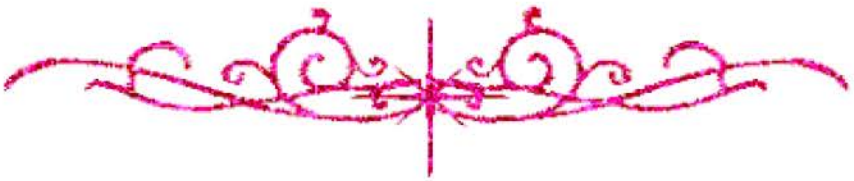

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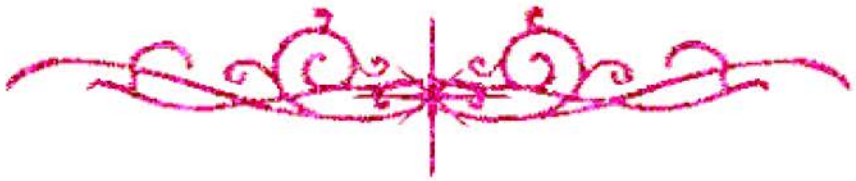

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بالرسالة صفحات

لم ترد بالأصل

HOSSAM MAGHRABY

A

Thesis

Entitled..

"SOME STUDIES ON THE PHYSICAL PROPERTIES OF CHEMICALLY AND THERMALLY EVAPORATED BISMUTHINITE (Bi_2S_3) FILMS".

Presented By . . .

OMAR HAMED MOHAMED

In partial Fulfillment For The Requirements of the Degree Of M.Sc.

Physics Department
Faculty of Science
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Ismailia, Egypt

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"SOME STUDIES ON THE PHYSICAL PROPERTIES OF CHEMICALLY AND THERMALLY EVAPORATED BISMUTHINITE (Bi_2S_3) FILMS".

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SOME STUDIES ON THE PHYSICAL PROPERTIES OF CHEMICALLY AND THERMALLY EVAPORATED BISMUTHINITE (Bi_2S_3) FILMS .

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SUMMARY

SUMMARY

The present work presented the results of studies of the structure and composition of the deposited bismuth trisulfide thin films and the relevance of their optical and electrical characteristics. Also, it is to investigate the effect of the thermal treatment on the structure, optical and electrical properties of the various films. The Bi_2S_3 films prepared by two deposition techniques [thermal evaporation and chemical deposition]. Two methods were used to determine the film thickness. All the films are examined before and after their thermal treatment, by X-ray diffraction and scanning electron microscope. The results could be summarized as follows :-

1- The structure of the thermally and chemically deposited Bi_2S_3 films was studied by scanning electron microscopy and X-ray diffraction. From X-ray analysis, the films obtained are nearly stoichiometric. A very well defined transition to the crystalline state is observed in both thin film and powder samples after annealing in air. The thermal stability of the powder samples shows an exothermic peak near 231°C. This is consistent with the amorphous to crystalline transition in chemically deposited Bi_2S_3 (powder) samples, as already indicated to the X-ray diffraction spectra. The crystallite size was estimated using scherrer formula. The electron micrographs of the non-heated layers demonestrate the increase in the grain size with increasing of dipping time. After heating the samples, the dimensions of the crystallites are not uniform and an aggregate of islands with overgrowth scattered here and there. The rate of deposition and the terminal thickness depend sensitively on the temperature of the deposition.

2- For optical measurements, Bi_2S_3 thick films were prepared by the two techniques. The optical constant (n and k) were determined from the transmission and reflection spectra. The extinction coefficient k, has its

minimum value at low energy and increases with increasing photon energy. But the refractive index n, remains almost constant as the photon energy increases. The absorption coefficient is of the order of 10^4 cm^{-1}, indicating that Bi_2S_3 is of direct band gap type and that transitions are allowed. The extrapolation of the energy axis [α^2 vs hν] gives a value of band gap equal to 1.68 ev for the chemically deposited films. In the thermal deposition, the direct energy gap [Eg = 1.6 ev] was calculated from the relation (3.15).

3- The electrical resistivity of the different samples was measured as a function of temperature. Two distinct regions are clearly seen corresponding to two activation energy. The activation energies for the two regions were calculated from the relation of ln R vs. 1 / T for a different thicknesses and conditions. At sufficiently high temperature, intrinsic conductivity starts and electron transitions from the valence band to the conduction band takes place. The thermal energy gap is 1.38 ev which agree with the value of 1.38 ev reported by other authors.

GENERAL INTRODUCTION