## Unraveling the effect of Bi2S3 on the optical, electrical and magnetic properties of ?-MnS-based composite thin films

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Abstract: (Bi2S3)x (?-MnS)1-x composite thin films have been deposited onto glass substrates using spray pyrolysis method. The structural and compositional investigations confirmed the co-existence of Bi2S3 and ?-MnS binary compounds in the thin films. The surface morphology indicated that the increase in Bi2S3 concentration influences both the shape and the size of ?-MnS crystallites. The optical analysis via transmittance and reflectance measurements revealed that the band gap energy Eg decreased from 3.29 eV to 1.5 eV in terms of Bi2S3 content. The electrical parameters such as resistivity ?, mobility ?, carrier concentrations and Hall coefficient have been obtained by Hall Effect measurements. It is found than incorporation of Bi2S3 enhances the conductivity, and p-type conduction of ?-MnS could be converted to n-type at x = 0.5. The vibrating sample magnetometer measurement has revealed that (Bi2S3)x (?-MnS)1-x composite thin films have a ferromagnetic behavior at room temperature.

Keywords : ?-MnS, Bi2S3, Spray pyrolysis, Magnetic Properties