




# Effect of annealing temperature on SnS thin films for photodetector applications

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## ABSTRACT

Tin sulfide (SnS) thin films were deposited at room temperature (RT) by thermal evaporation method and subsequently annealed at 150–350 °C in N<sub>2</sub> atmosphere. The influence of annealing temperature on composition, structural, morphological and optical properties of the thin films has been investigated. X-ray diffraction (XRD) analysis and Raman studies confirmed the formation of single phase SnS films at RT and annealed up to 300 °C. The crystallite size increased from 24 nm for as-deposited film to 37 nm for the 300 °C annealed film and further reduced to 18 nm for the 350 °C annealed film. The film annealed at 200 °C was found to have better morphological features with (111) preferred oriented crystallites. The absorption coefficient, optical band gap ( $E_g$ ) of the deposited films were estimated from the optical transmittance measurements. Photodetectors are fabricated by depositing Ag contacts on SnS thin films using a metal mask and photo response was tested under dark and illumination conditions using 532 nm laser of varying power intensities. The photodetectors performance is evaluated using responsivity ( $R$ ), external quantum efficiency (EQE), and specific detectivity ( $D^*$ ). The specific detectivity of  $6.8 \times 10^{10}$  Jones obtained in the present study is nearly two orders of magnitude greater than that reported earlier.

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