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Six complexing agents and their effects on optical, structural, morphological and photoluminescence properties of Lead sulphide thin films prepared by chemical route

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Abstract:

Lead sulphide (PbS) nanocrystalline thin films were deposited on silica glass substrate by chemical bath deposition method at a bath temperature of 70 °C from six different complexing agents. Different characterization techniques were employed to investigate the effect of applying various complexing agents on the growth mechanism and physical properties of PbS thin films. The XRD results revealed that all the deposited thin films shows a face centered cubic crystal structure however, the preferred orientations of the crystallites varied along the (111) and (200) planes with complexing agents. It was also observed that the complexing agents had a strong influence on the average crystalline size, microstrain and dislocation density of the PbS thin films. The EDX study confirmed that complexing agents had a noticeable effect on the stoichiometry of PbS thin films. The optical absorption spectroscopy study revealed that the optical band gap of the PbS thin films found in the range of 0.77 eV to 1.34 eV. The room temperature photoluminescence study verified that irrespective of complexing agents all the deposited thin films experienced emission at 761 nm. Raman studies showed a strong peak around 134 cm⁻¹ irrespective of complexing agents.

Key words: Complexing agents, Lead sulphide, Thin film, Chemical bath deposition

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