

Sulfide precursor concentration and lead source effect on PbS thin films properties

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Abstract: Lead sulfide (PbS) thin films were synthesized using chemical bath deposition (CBD). Bath solutions are formed of various concentrations of thiourea, sulfide source, ranged from 0.6 to 1.2 M and two different salts as Pb source (lead acetate and lead nitrate). From the growth mechanism, we inferred that PbS is formed through the ion by ion process when using acetate lead source, while, using nitrate source yields to films growth through the complex decomposition process. Due to the difference in the involved growth process, lead acetate produces films with larger crystallite size (from 4 to 16 nm), smooth and dense films. However, lead nitrate produces rough films with smaller crystallite size (from 1 to 4 nm). Increasing the thiourea concentration results in crystallinity improvement when using lead acetate and, oppositely, in crystallinity degradation when using lead nitrate. Due to the quantum effect caused by the small crystallite sizes, the films optical gap is varied from 0.5 to 0.9 eV.

Keywords : Thin films Lead sulfide Chemical bath deposition