

Structural Properties of Nanocrystalline PbS Thin Films Prepared by Chemical Bath Deposition Method

A.S.Obaid^{ab}M.A.Mahdi^{ac}Y.Yusof^aM.Bououdina^{de}Z.Hassan^a

^a Nano-Optoelectronics Research and Technology Laboratory, School of Physics, Universiti Sains Malaysia, 11800 USM, Penang, Malaysia

^b Department of Physics, College of Sciences, University of Anbar, P.O. Box 55431, Baghdad, Iraq

^c Physics Department, College of Science, Basrah University, Basrah, Iraq

^d Nanotechnology Centre, University of Bahrain, P.O. Box 32038, Kingdom of Bahrain

^e Department of Physics, College of Science, University of Bahrain, P.O. Box 32038, Kingdom of Bahrain

Abstract

Nanocrystalline PbS thin films were prepared using chemical bath deposition method on glass substrates, together with lead acetate as a source of lead ions (Pb^{2+}) and thiourea as a source of sulfide ions (S^{2-}) with different molar concentrations. The structural properties of thin films were studied using X-ray diffraction. The patterns showed a polycrystalline structure, and the preferred orientation changed along (111) and (200) planes. The grain size of the thin films varied from 27 to 41 nm. The crystallites were under strain, which varied between 0.054 and 0.3. Scanning electron microscope images showed that all the films have uniform surface morphology over the entire glass substrate and that the films were of good quality.

Keywords

Thin films ;Chemical synthesis; Atomic force microscopy ;X-ray diffraction; Optical propertie