Formation of polycrystalline SnS layers by a two-step process

Authors: K. T. Ramakrishna Reddy, P. Purandhara Reddy, P. K. Datta and R. W. Miles

Abstract:

Thin films of SnS have been produced by a novel two-stage process. This involved the deposition of thin films of Sn onto glass substrates using d.c. magnetron sputtering followed by conversion of the metallic layers into the compound by annealing in the presence of elemental sulfur. All the layers synthesised were found to be polycrystalline, the grain size and crystallinity of the layers increasing with increasing annealing temperature. The precursor layers sulfurised at temperatures <300°C and >350°C, were found to be non-stoichiometric and X-ray diffraction data indicated the presence of a range of binary phases other than SnS. The best SnS layers were synthesised for annealing temperatures between 300 and 350°C. These layers were found to be stoichiomentric with a strong {111} preferred orientation. The stoichiometric SnS layers had resistivities of 1.5×10^{2} Ωcm and Arrhenius plots of the resistivity gave an activation energy of 0.65 eV. The optical energy band gap of the layers was 1.35 eV. These p-type layers could find application as absorber layers in thin film solar cells.