

Effect of Selenizing Atmosphere on the Properties of CuInSe₂ Thin Films

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CuInSe₂ thin films have been prepared by selenizing Cu/In metal layers both at 450°C for 1 hr and at 570°C for 10 min with pure selenium as a selenium vapor source. The H₂/N₂ volume fraction was varied during the selenization and the effect of H₂ in selenizing atmosphere on the properties of the CuInSe₂ films was investigated by analyzing the morphological, structural, and compositional changes of the CuInSe₂ films.

All the selenized CuInSe₂ thin films crystallized in a chalcopyrite structure and the grain size of the 1 μm thick CuInSe₂ films ranged from 1 to 3 μm. The films had a more (112) preferred orientation and both the a-axis and c-axis lattice constants increased with increasing the amount of hydrogen in selenizing atmosphere up to 15 volume percent. Also, the resistivity and its activation energy increased significantly as the hydrogen volume percent in the selenizing atmosphere increased. The compositional analysis showed that the Cu/In ratios decreased with increasing the hydrogen volume percent. The results indicated that the role of hydrogen in the selenizing atmosphere was to reduce the indium loss during selenization, causing the increase in the (112) texture, the a-axis and c-axis lattice constants, and the electrical resistivity.