

Abstract

Ion layer gas reaction (ILGAR) method allows for deposition of Cl-containing and Cl-free In_2S_3 layers from InCl_3 and $\text{In}(\text{OCCH}_3\text{CHOCCH}_3)_3$ precursor salts, respectively. A comparative study was performed to investigate the role of Cl on the diffusion of Cu from CuSCN source layer into ILGAR deposited In_2S_3 layers. The Cl concentration was varied between 7 and 14 at.% by varying deposition parameters. The activation energies and exponential pre-factors for Cu diffusion in Cl-containing samples were between 0.70 to 0.78 eV and between 6.0×10^{-6} and 3.2×10^{-5} cm^2/s . The activation energy in Cl-free ILGAR In_2S_3 layers was about three times less compared to the Cl-containing In_2S_3 , and the pre-exponential constant six orders of magnitude lower. These values were comparable to those obtained from thermally evaporated In_2S_3 layers. The residual Cl-occupies S sites in the In_2S_3 structure leading to non-stoichiometry and hence different diffusion mechanism for Cu compared to stoichiometric Cl-free layers.