// Abstract

Thin Film deposition is done by pulsed dc magnetron sputtering system with various sputtering powers. X-ray diffraction (XRD) analysis, scanning electron microscopy (SEM), four probe analysis and ellipsometric analysis are performed for structural, morphological, electrical and optical properties measurement. After these analysis deposited films are implanted with Cu ion using Pelletron accelerator. X-ray diffraction and optical ellipsometry analysis are repeated to notice the effect of ion implantation on structural and optical properties of deposited thin films. X-ray diffraction analysis confirms the coexistence of hexagonal and cubic phases of zinc sulfides for low sputtering powers (25 to 35 W), whereas relatively high powers (50 W) supported the cubic phase formation with (311) plane reflection. Crystallite sizes, dislocation density and macrostrain are calculated using XRD data and results reveal increase in crystallite size with increase in sputtering power, while dislocation density and macrostrain show decreasing trend. Morphological analysis confirms strong dependence of surface morphology on sputtering powers, a network of micro needles is observed for 50 W sputtering power. Electrical resistivity results show decrease in resistivity with increasing sputtering power, which is strongly related to morphology of the deposited thin films, crystalline size, dislocation density and macrostrains developed in thin films. Optical analysis shows decrease (3.64 eV TO 2.7 eV) in optical band gap with increasing sputtering powers. After that ion implantation of Cu ions is done which show a further decrease in the band gap values of thin films ranging from 3.4 eV to 2.12 eV.