

Fabrication and Characterization of Cu-doped ZnO Films Using RF Reactive Magnetron Sputtering

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Abstract. ZnO thin films have emerged as an interesting research area owing to its useful properties. Recently, lots of attention have been given to doped ZnO with Cu atom due to its favourable potential in semiconductor devices. Pure and Cu-doped ZnO (CZO) thin films were deposited on the glass, p-GaN/Al₂O₃ and n-GaN/Al₂O₃ substrates using radio frequency magnetron sputtering of Cu/ZnO alloy target with a ratio of 10/90 at 200 °C. The crystal structure, optical properties, surface morphology and electrical properties were investigated by using X-ray diffraction (XRD), ultraviolet-visible (UV-VIS) spectrophotometer, atomic force microscopy (AFM) and Hall measurement with four-point Van der Pauw configuration respectively. XRD analysis showed that single phase ZnO with hexagonal wurtzite structure and c-axis orientation was fabricated. The transmittance of all films deposited on glass in the visible region were more than 85%. The optical band gap of the films were calculated by using transmittance data obtained from UV-VIS spectrophotometer. Optical band gap reduction occurred when Cu is introduced into ZnO. Deposited CZO films showed smoother surface compare with ZnO films. Hall measurement results revealed that CZO film deposited on n-GaN/Al₂O₃ had higher mobility and conductivity than pure ZnO films.