

Abstract

Copper Oxide (CuO) and Zinc Oxide (ZnO) thin films were deposited on conductive glass substrates using DC reactive sputtering for gas sensor applications. Argon and Oxygen gases have been used as sputtering gas and reactive gas, respectively.

For CuO thin films the sputtering pressure and the substrate temperature were increased from 6 to 8.5mbar and from 70 to 192⁰C, respectively. All the synthesized films contain single phase of CuO in this range of pressure and substrate temperature. The crystallite sizes vary from 9.03 to 22.47 nm as estimated by Scherrer formula. The crystallites favoring perpendicular orientations dominate at higher deposition pressures due to higher deposition rates. Due to smaller crystallite sizes, the film deposited at 192⁰C under 8.5mbar pressure provides gas sensitivity as high as 19.26 after keeping 10 minutes in CO₂ gas at room temperature. The sample fabricated at 192⁰C and 9 mbar indicates a sharp drop of CO₂ gas sensitivity from 3.67 to 0.84 at operating temperature 75⁰C.

All these samples are not sensitive to N₂ gas according to cross-sensitivity measured in N₂ gas. Zinc Oxide thin films have been synthesized in the deposition temperature range from 130 to 153⁰C at chamber pressure of 8.5mbar for 18 hours. The structure of the films determined by means of the X-Ray diffractometer (XRD) at University of Peradeniya, indicates that the Zinc Oxide single phase can be fabricated in this substrate temperature range. The sensitivity of the films synthesized at substrate temperature of 130⁰C is 2.17 in the presence of CO₂ gas at the measuring temperature 100⁰C. .