

Oxidation of Cu nanoclusters in Cu / Cu-Fe-O nanocomposites thin films deposited by rf sputtering.

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Abstract

Nanocomposites metal / oxide (Cu / Cu-Fe-O) thin films were deposited on glass substrates by radio-frequency (rf) sputtering. The rf sputtering depositions were carried out under different plasma conditions and using sintered ceramic disks of Cu Fe - O compositions as target in accordance with the Cu/Fe = 1 ratio. All films showed polycrystalline nanostructured spinel-type oxide matrix in which Cu nanoclusters are uniformly spread out. The structure and properties of these thin films were determined in their as-deposited and annealed states using grazing incidence X-ray diffraction (GIXRD), transmission electron microscopy (TEM), atomic force microscopy (AFM), optical transparency in the UV-Visible range and electrical conductivity versus temperature. Within the oxide matrix, two phases of binary copper oxides Cu₂O and CuO were found at various temperature depending on the deposition conditions. Ternary oxides are also evidenced and characterized as a function of the annealing treatment