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Thermally Evaporated Copper Oxide Films: A View of Annealing Effect On Physical and Gas Sensing Properties

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Abstract

The present paper reports a facile approach to prepare copper oxide (CuO) films directly onto a glass substrate by thermal evaporation method and their chemiresistive properties towards hazardous nitrogen dioxide (NO₂). The influence of annealing temperature on structural, morphological, and gas sensing properties of the CuO films has been thoroughly investigated and reported. Structural and morphological analyses has confirmed the formation of polycrystalline monoclinic CuO with uniformly distributed nanoparticles over the substrate surface. Gas sensing measurements on CuO films reveal the high response, excellent selectivity, fast response-recovery time signatures, good repeatability, and stability towards lower concentration of NO₂ gas @150 °C. A maximum response of 48% towards 100 ppm NO₂ has been achieved. Gas sensing results demonstrate an influence of morphology on the NO₂ sensing performance of CuO films. In addition, the interactions between CuO sensor film and NO₂ gas molecules are studied through an impedance spectroscopy analysis.

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