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Structural, Optical and Photocatalytic properties of Fe and (Co,Fe) co-doped Copper Oxide Spin Coated Films

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Abstract

Copper oxide films with composition $Cu_{1-x-y}Fe_xCo_yO$ (where $x \leq 0.06$ and $y \leq 0.03$ in a molar ratio) and thickness of about 2 μm were spin coated onto ultrasonically cleaned glass substrates. These films were annealed at 500 ^oC in the air. XRD results show that films are CuO of polycrystalline and monoclinic structures without the detection of any Fe or Co traces. The average crystallite size of pure CuO is 20.44 nm reduced to 18.72 nm after Fe doping, then increased to 26.82 nm due to the co-doping with Co atoms. The optical band gap blue-shifted from 2.15eV to 2.3 eV followed by red-shift to 2.15 eV after the Co incorporation. The influence of Fe doping and Co co-doping on the optical constants of CuO films as well as the photocatalytic removal of methylene blue (MB) dye is reported. The correlations between the structural modifications and the resultant optical properties are discussed. The obtained results of the fabricated system are compared with those of similar materials.

Keywords: CuO; Nanostructured films; co-doping; band gap tuning; optical constants; Dye removal.

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