

## Effects of Copper and Cobalt Co-Doping on Structural, Optical and Electrical Properties of TiO<sub>2</sub> Thin Films Prepared by Sol Gel Method

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**Abstract :** Un-doped TiO<sub>2</sub>, Co single doped TiO<sub>2</sub> and (Cu-Co) co-doped TiO<sub>2</sub> thin films have been growth on silicon substrates by the sol-gel dip coating technique. We mainly investigated both effects of the dopants and annealing temperature on the structural, optical and electrical properties of TiO<sub>2</sub> films using X-ray diffraction (XRD), Raman and FTIR spectroscopy, Atomic force microscopy (AFM), Scanning electron microscopy (SEM), UV-Vis spectroscopy. The chemical compositions of Co-doped and (Cu-Co) co-doped TiO<sub>2</sub> films were confirmed by XRD, Raman and FTIR studies. The average grain sizes of CoTiO<sub>3</sub>-TiO<sub>2</sub> nanocomposites were increased with annealing temperature. AFM and SEM reveal a completely the various nanostructures of CoTiO<sub>3</sub>-TiO<sub>2</sub> nanocomposites thin films. The films exhibit a high optical reflectance with a large band gap. The highest electrical conductivity was obtained for the (Cu-Co) co-doped TiO<sub>2</sub> films. The polyhedral surface morphology might possibly improve the surface contact between particle sizes and then contribute to better electron mobility as well as conductivity. The obtained results suggest that the prepared TiO<sub>2</sub> films can be used for optoelectronic applications.

**Keywords :** sol-gel, TiO<sub>2</sub> thin films, CoTiO<sub>3</sub>-TiO<sub>2</sub> nanocomposites films, Electrical conductivity

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