

Dielectric and electrical proprieties of Nano-TiO₂ powders and thin films doped by copper at room temperatures

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Abstract

In this work, we have made a parallel study using both powders and thin layers of TiO₂ doped by copper (Cu). Annealing temperatures effects and the Cu dopant concentration on the phase composition, chemical banding and microstructure were characterized by X-ray diffraction, Raman spectroscopy, transmission electron microscopy (TEM) and Atomic force microscopy (AFM). Both the dielectric properties of Cu doped TiO₂ powders and the electrical resistivity of the films were acquired at room temperatures. The details outcome from XRD and Raman spectroscopy display that only the anatase TiO₂ crystallization has been obtained for both films and powders as a function of annealing temperature and the Cu addition. Both the Impedance Spectroscopy and Nyquist diagrams Curves of Cu doped TiO₂ were obtained at room temperature. The electrical resistivity (ρ) was found decreasing from $4.5 \cdot 10^{11}$ to $8.7 \cdot 10^{10}$ with the annealing temperature and the Cu addition.

Keywords: Cu doped anatase TiO₂, Impedance Spectroscopy, Nyquist diagrams, electrical resistivity (ρ).