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Influence of Ga doping on structural, optical and electrical properties of transparent conducting SnO2 thin films

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Abstract

Different concentrations (1, 3, and 5 at %) of Ga doped SnO2 thin films were deposited onto glass substrate using sol-gel spin coating technique. X-ray diffraction studies revealed that all deposited films were exhibited tetragonal rutile structure of SnO2 with preferred orientation along (110) direction. The AFM micrographs shown that the grains are in spherical structure, and the average grain size decreased with the increase of Ga doped concentration in SnO2 lattice. In the visible light region, the average transmittance of pure SnO2 film found to be above 85%, whereas Ga doped SnO2 films were found to be a decrease of transmittance up to 74 % in 5 at % Ga doped SnO2 film. The optical band gap energy values were considerably decreased from 3.92 to 3.68 eV with the increase of Ga content. Further, the sheet resistance (Rsh) and resistivity (ρ) values were found to be increased with the increase of Ga doping. The efficiency parameter figure of merit (ϕ) was estimated for all deposited films and it was found to be decreased from 3.3 × 10-3 Ω-1 for pure SnO2 to 0.7 × 10-3 Ω-1 for 5 at % Ga doped SnO2 film.

Keywords:

Dye doped crystal, Dielectric properties, Electrical conducctivity

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