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Enhancing Optical and Electrical Performance of ZnO Thin Films by Mg dopant

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Transparent conductive materials that are conducted and transmissive are an important aspect in the field of optics and electronics as they play a major role in modern optoelectronic devices. Zn1-xMgxO (x = 0.01) thin films are such material that lies in the category of Transparent conducting materials exhibiting exciting properties like low absorption of light, and high transmission. The study's objective is to analyze the influence of Mg doping on pure ZnO thin films formed on a glass substrate by the sol-gel spin coating approach annealed at 500℃ for five hours. According to the X-ray diffraction study, the films showed a maximum intensity hexagonal wurtzite structure in the (1 0 1) plane. As the Mg doping concentration increased, the diffraction peaks reduced. Optical properties indicate transmittance, absorbance, reflection, refractive index, extinction coefficient, and optical band gap. By increasing Mg doping, optical examination revealed a considerable increase in transmittance from 82.7 to 88.7 % in the visible region. Also, the energy band gap values reduce from 3.25 eV to 3.14eV because of the s–d and p–d exchange interactions. When the concentration of magnesium in ZnO increases, there is a trend toward an increase in both the mobility and electrical conductivity of the magnesium-doped thin films. The excellent optical and electrical properties confirm that Mg-doped ZnO thin films are promising candidates for transparent conducting oxide applications.

Type of presence

Presence online

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