

Influence of Al doping on structural,optical and electrical properties of ZnO thin films prepared by spray pyrolysis method

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Abstract

The nano-structural Al-doped ZnO thin films of different morphologies deposited on glass substrate were fabricated at substrate temperature at 450°C by cost effective spray pyrolysis method. The structural, electrical and optical properties of ZnO and ZnO: Al films were investigated using X-ray diffraction (XRD),scanning electron microscope (SEM),atomic force microscope (AFM),UV-vis and electrical measurement. X-ray diffraction study revealed the crystalline wurtzite structure of the films with nano-grains. Scanning electron microscopy micrographs indicated the formation of a large variety of nano-structures. Spectrophotometric measurements in UV-visible showed that all the films have a high transmission more 90% in the visible and the band gap energy varies according to the doping level.

The best electrical resistivity value was around $7.70 \cdot 10^{-5} \Omega \cdot \text{cm}$ obtained for 2 % Al content.

Keywords: Aluminum-doped zinc oxide; Spray pyrolysis; X-ray diffraction; Electrical conductivity; optical proprieties.