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Effect of Er doping on structure, optical and electrical properties of the fabricated Schottky diodes based on ZnO thin films prepared by sol-gel spin coating

Er-doped ZnO thin films (0, 2, 4 and 6 at.% Er) were prepared using the sol-gel spin coating technique. The morphology of the thin films was studied using scanning electron microscopy (SEM). The structure was investigated by X-ray diffraction (XRD). It was found that the films have hexagonal wurtzite structure with randomly orientated particles and the crystallite size decreased from 32 nm to 8 nm as the Er increased from 0 at.% to 6 at.%. The optical properties were studied using UV-Vis spectroscopy. The films exhibited good transmittance in the visible region and a sharp absorption peak in the UV region. The optical band gap of the films calculated from Tauc plot was found to increase from 3.024 eV to 3.157 eV as the Er increased from 0 at.% to 6 at.%. Schottky diodes were produced by resistively depositing Pd contacts onto the Er-doped ZnO thin films. The electrical properties of Schottky diodes based on Er-doped ZnO thin films were characterized using I-V measurements. All the diodes exhibited good rectification behavior. The calculated Schottky barrier height at room temperature was found to be 0.649 eV, 0.738 eV, 0.714 eV and 0.723 eV for Er 0 at.%, Er 2 at.%, Er 4 at.% and Er 6 at.%, respectively. The I-V characteristics were studied at room temperature under the dark and illumination conditions using a solar simulator with 1000 mW/cm². All the diodes exhibited a high response to the light. This is probably due to the Er in the ZnO.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

PhD

Primary author: AHMED, Mohammed (Physics department, University of Pretoria)

Co-authors: MEYER, Walter (University of Pretoria); NEL, Jacqueline (University of Pretoria)

Presenter: AHMED, Mohammed (Physics department, University of Pretoria)

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