

Physical properties of Gra-doped ZnFe₂O₄ thin films for solar cells application

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The Zinc ferrite (ZnFe₂O₄) has significantly attracted many researchers due to their chemical and thermal stability [1] and their narrow band gap [2]. In this present research we successfully studied the influence of Graphene (Gra) doping on the physical properties of zinc ferrite thin films. The undoped and Gra-doped ZnFe₂O₄ nanofilms were grown onto glass substrates using spray pyrolysis technique at a substrate temperature of about 450°C. The elaboration process was followed by an annealing process in air at 500°C for 2 hours. We present in this investigation the effect of graphene on the structural (by XRD), optical (by Spectrophotometry), electrical (by I-V curves and Impedance spectroscopy) and morphological (by SEM and AFM) properties of ZnFe₂O₄. The X-ray diffraction results confirmed that the prepared undoped and Gra-doped ZnFe₂O₄ had cubic spinel crystal structure with preferential orientations along the (311) plan. The Transmission increase from 71 to 81% with increasing the doping concentration. For the band gap, it decreases from 2.57 to 2.31 eV as the graphene cocentration is increased. The solar cell designed with the structure ZnO/ZnFe₂O₄/CIGS was optimised and tested using Silvaco software. The simulation proves that the graphene doped ZnFe₂O₄ used as buffer layer improve the efficiency of the solar cell.

The experimental results further revealed that Graphene doping had a considerable effect on the structural, electrical, optical and morphological properties of ZnFe₂O₄.

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