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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℃. The elaboration process was followed by an annealing process in air at 500℃ 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 comfirmed that the prepared undoped and Gra-doped ZnFe2O4 had cubic spinel crystal structure with preferentiel 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 optimased 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.

Author: DHIF, Fatma Ezzahra (Faculté des Sciences de Tunis)

Co-authors: Prof. VOMIERO, Alberto (Department of Molecular Sciences and Nanosystems, Ca'Foscari University of Venice, Italy.); Prof. MORETTI, Elisa (Department of Molecular Sciences and Nanosystems, Ca'Foscari University of Venice, Italy.); Dr IBRAHIM BELAY, Kassa (Department of Molecular Sciences and Nanosystems, Ca' Foscari University of Venice, Italy.); Prof. KAMOUN, Najoua (Faculté des Sciences de Tunis)

Presenter: DHIF, Fatma Ezzahra (Faculté des Sciences de Tunis)