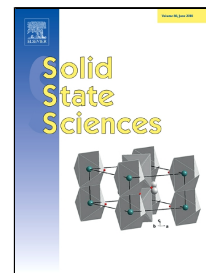


Accepted Manuscript

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PII: S1293-2558(18)30356-X
DOI: 10.1016/j.solidstatesciences.2018.05.016
Reference: SSSCIE 5702
To appear in: *Solid State Sciences*
Received Date: 29 March 2018
Accepted Date: 27 May 2018

Please cite this article as: Soheila Osali, Hamid Esfahani, Hamid Reza Karami, Effect of Al doping on Crystallography and Electro-Optical properties of ZnO Semiconductor Thin Films Prepared by Electrospinning, *Solid State Sciences* (2018), doi: 10.1016/j.solidstatesciences.2018.05.016

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Effect of Al doping on Crystallography and **Electro-Optical** properties of ZnO Semiconductor Thin Films

Prepared by Electrospinning

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Abstract

Zinc oxide (ZnO) thin film has in recent years emerged due to its unique physical, electrical and chemical properties. The microstructural and optical properties of nanocrystallite ZnO films fabricated using electrospinning and post-calcination, undoped and doped with aluminum, (AZO nanostructure films) were investigated in this study. The results indicated that the crystallized and monolithic AZO films comprised perfectly linked ZnO nanoparticles (NPs). Al incorporation deformed the lattice geometry (a and c axis) and crystallite size of (002) plane, and led to formation of zinc vacancies and Al interstitial/substituted sites. Functional molecule groups and optical properties of pristine ZnO and AZO films were studied by far-FTIR, PL and UV-Vis techniques. Our findings showed that doping ZnO with Al resulted in the Zn-O bond shifting towards higher energy levels, and it polarized the visible lights more than pure ZnO thin films. Furthermore, the formation of the large concentration of point defects in sub-atomic structure of AZO (6 wt.% Al) reduced the optical band gap energy of ZnO from the 3.4 eV to 3.05 eV. **The optical transmittance of AZO films was higher than 83% in visible light range. The electrical conductivity of ZnO film was improved by Al incorporation.** The results of present work indicated that the electrospinning is a promising method to fabricate the nanostructured AZO films for use in electro-optical applications such as solar cells.

Keywords: AZO; Crystallography; Band gap; Electrospinning; Nano fibers; Photoluminescence;

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