

Accepted Manuscript

An insight to origin of ferromagnetism in ZnO and N implanted ZnO thin films:
Experimental and DFT approach

Parmod Kumar, Hitendra K. Malik, Anima Ghosh, R. Thangavel, K. Asokan



PII: S0925-8388(18)32597-0

DOI: [10.1016/j.jallcom.2018.07.097](https://doi.org/10.1016/j.jallcom.2018.07.097)

Reference: JALCOM 46813

To appear in: *Journal of Alloys and Compounds*

Received Date: 28 February 2018

Revised Date: 25 June 2018

Accepted Date: 9 July 2018

Please cite this article as: P. Kumar, H.K. Malik, A. Ghosh, R. Thangavel, K. Asokan, An insight to origin of ferromagnetism in ZnO and N implanted ZnO thin films: Experimental and DFT approach, *Journal of Alloys and Compounds* (2018), doi: 10.1016/j.jallcom.2018.07.097.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

An Insight to origin of ferromagnetism in ZnO and N implanted ZnO thin films: Experimental and DFT approach

Parmod Kumar^{1,2,*}, Hitendra K. Malik^{2,*}, Anima Ghosh³, R. Thangavel³ and K. Asokan²

¹Materials Science Division, Inter University Accelerator Centre, New Delhi – 110067, India

²Department of Physics, Indian Institute of Technology Delhi, New Delhi – 110016, India

³Department of Applied Physics, Indian Institute of Technology (Indian School of Mines), Dhanbad– 826004, India

In the present study, we have elucidated an effective way to simultaneously tune the optical bandgap and magnetic properties of zinc oxide (ZnO). This can be achieved by the incorporation of nitrogen ions via any means in the host matrix. On a broader way, we have systematically investigated the influence of N ions in ZnO thin films through experimental techniques and density functional theory (DFT) calculations to understand the physical mechanism governing the observed magnetic behaviour and variation in bandgap. For this, RF sputtered ZnO thin films deposited over Si substrates were implanted with N ions by varying the fluences and studied for their optical and magnetic properties. The pristine ZnO films is having saturation magnetization of $\sim 2.45 \text{ emu/cm}^3$ which becomes almost twice compared for the fluence of $1 \times 10^{17} \text{ ions/cm}^2$. Furthermore, the optical bandgap is tuned from 3.27 eV to 3.04 eV with N ion fluences. Our work signifies the new insight to understand the basis of ferromagnetism in non-magnetic ions doped ZnO system.

Keywords: Ion implantation, bandgap tuning, defects induced magnetism, first principle calculations.

Corresponding authors:

*Email: parmodphysics@gmail.com, hkmalik@hotmail.com

Phone: +91-11-26893955, Fax: + 91-11-26893666

Present Affiliation of Corresponding author: Department of Physics, Deenbandhu Chhotu Ram University of Science and Technology, Murthal, Sonapat-131039, India

Download English Version:

<https://daneshyari.com/en/article/7990136>

Download Persian Version:

<https://daneshyari.com/article/7990136>

[Daneshyari.com](https://daneshyari.com)