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Authors: B Ghosh, Dilip K Mishra, H.T Wang, T.S Mahule, Sekhar C Ray, W.F Pong



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X-ray absorption, photoemission and electron spin resonance studies of Ar⁺ ion implanted ZnO

B. Ghosh^{1,(a)}, Dilip K. Mishra², H.T. Wang³, T. S. Mahule¹, Sekhar C. Ray^{1,*}, W. F. Pong⁴

¹Department of Physics, CSET, University of South Africa, Private Bag X6, Florida, 1710, Science Campus, Christiaan de Wet and Pioneer Avenue, Florida Park, Johannesburg, South Africa

²Department of Physics, Faculty of Engineering and Technology (ITER), Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar 751 030, Odisha, India

³Department of Physics, National Tsing-Hua University, Hsinchu 30013, Taiwan

⁴Department of Physics, Tamkang University, Tamsui 251, Taipei, Taiwan

* Corresponding author: Raysc@unisa.ac.za and sekharchandraray@gmail.com

^(a) Present Address: Faculty of Engineering, University of Nottingham, University Park, Nottingham NG7 2RD, UK.

Highlights

- Increase of Zn L_3 -edge and O K -edge intensity indicates the increase of local density of states.
- Increase of density of states is due to the surface defects and/or dangling bonds in ZnO.
- The Zn $2p_{3/2}$ core level XPS studies confirm the formation of oxygen vacancies/defects.
- Room temperature ferromagnetism is due to vacancies/defects.

ABSTRACT

Defect induced room temperature ferromagnetism (RT-FM) in Ar⁺ implanted ZnO single crystal (ZnO-SC) is observed from the electron Spin Resonance (ESR) spectra and is correlated with their electronic structure studies using synchrotron radiation based X-ray absorption near edge structure (XANES) spectroscopy and valence band photoemission spectroscopy (VB-PES). Enhancement of absorption intensity at the edge of XANES spectra of Ar⁺ implanted ZnO indicates the increase of local density of states (DOS); which arises from the surface defects and/or dangling bonds in ZnO. VB-PES spectra change upon Ar⁺ implantation, becoming broader, implying the induced surface defects in ZnO-SC. X-ray photoelectron spectroscopy studies confirm that the Zn $2p_{3/2}$ core level peak

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