

Seminar

Institute for Plasma Research

Title : Phase transformation studies for CdO based thin films and nano-composites

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Date : 2nd May 2019 (Thursday)

Time : 03:30 PM

Venue : Committee Room 4, (New Building), IPR

Abstract :

Structural, optical, microscopic and electronic properties have been investigated for pure CdO, Sn doped and Ni doped CdO solgel derived thin films. Interesting band gap enhancement has been explained in the frame work of charge neutrality level and orbital hybridization ($p-d$ orbitals) for Sn doped CdO thin film which has further been endorsed by swift heavy ion irradiation based experiments. For Ni doped CdO thin films, same has been explained incorporating the concept of electron-electron interaction, electron-impurity interaction and reduced orbital hybridization which has been experimentally demonstrated with soft x-ray absorption (SXA) measurements by probing oxygen K edge. Further, structural phase transformation (PT) i.e. from rocksalt to wurtzite phase has been observed for pure CdO thin films at higher annealing temperature with top down approach with reduced thickness. Subsequently, SXA at oxygen k -edge revealed a notable shift in inflection point of absorption edge which is compatible with band gap change of the transformed wurtzite phase while X-ray Photoelectron Spectroscopy (XPS) of Cd 3d and O 1s suggested the gradual reduction in CdO₂ phase with increasing annealing temperature. Molecular dynamics simulation along with density functional theory calculation is suggested that symmetry modification at Brillouin zone boundary provides a succinct signature for such PT in CdO thin film and endorse well all the experimental evidences regarding PT. However, analysis of few interesting results is also going on, i.e. 478 cm⁻¹ LO phonon mode enhancement below CdO Debye temperature in temperature dependent spectroscopy measurements, discrepancy in thermal spike calculation with experimental results etc.
