Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Role of Donor defects in stabilizing room temperature ferromagnetism in Co doped ZnO LUBNA SHAH, Department of Physics and Astronomy, University of Delaware, Newark, Delaware 19716, YUAN-QIANG SONG, University of Electronic Science and Technology of China, Chengdu, People's Republic of China., HUAI-WU ZHANG, University of Electronic Science and Technology of China, Chengdu, People's Republic of China , WEIGANG WANG, ZHU HAO, JOHN XIAO, Department of Physics and Astronomy, University of Delaware, Newark, Delaware 19716 — Extensive experimental and theoretical work has been done on transition metal doped ZnO diluted magnetic semiconductor, in which defects play a vital role in promoting carrier-mediated ferromagnetism. We explored the influence of interstitial Zinc on physical properties of Co doped ZnO by exposing Co0.05Zn0.95O in a Zn vapor. Both X-ray diffraction and X-ray photoelectron spectroscopy indicate the substitution of Co2+ in the ZnO lattice. Observed room temperature ferromagnetism in bulk samples shows a decreasing trend with decreasing temperature. This can be explained by taking into the reduction of the carrier density, induced by the interstitial Zn ions, at low temperature. Carrier density at room temperature is about 8.5 x 10^{19}/cc, which is consistent with predicted value for polaron percolation threshold to induce long range ferromagnetism. The carrier density fell below this threshold at low temperature, results in the disappearance of the ferromagnetism.

Lubna Shah
Department of Physics and Astronomy, University of Delaware, Newark, Delaware 19716

Date submitted: 14 Dec 2007 Electronic form version 1.4