

Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Wide bandgap semiconductor nanoclusters: Magnetism and UV photoluminescence JIJI ANTONY, University of Idaho, DAVID E. MCCREARY, MARK ENGELHARD, CHONGMIN WANG, Pacific Northwest National Laboratory, AMIT SHARMA, JOSEPH NUTTING, DANIEL MEYER, YOU QIANG, University of Idaho, PACIFIC NORTHWEST NATIONAL LABORATORY COLLABORATION — Transition metal-doped ZnO is of great interest to current research due to its wide variety of applications in spintronic materials. We prepared 5% Ti, V, Co or Ni-doped ZnO nanoclusters using a third generation nanocluster source. TEM images show that the nanoclusters are monodispersive with a nanocrystalline size < 10 nm. XRD patterns are identical to the bulk ZnO wurtzite structure. XPS detected the dopant elements in clusters and showed Ti in +4 oxidation state, V in +4 and +5, Co in +2, and Ni in +2 and +3. These analyses indicate that dopant elements do not exist as independent aggregates but are incorporated into the ZnO structure. All the doped ZnO nanoclusters are ferromagnetic above room temperature. Magnetic moments of Ni or V-doped ZnO are much larger than Ti or Co doped ZnO clusters at 300K. Double exchange interactions due to the mixed valance states can be the reason that Ni or V-doped ZnO clusters a better magnetic moment than the Ti or Co-doped clusters. UV-photoluminescence is observed at pure and low dopant concentration ZnO nanoclusters.

Jiji Antony
University of Idaho

Date submitted: 28 Dec 2005

Electronic form version 1.4