Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Study of Thermally Induced Damage and its Recovery in ZnO Single Crystals by Elastic Resonant Ion Channeling S. DHAR, D. PUGEL, S.S. HULLAVARAD, R.D. VISPUTE, S.B. OGALE, T. VENKATESAN, Center for Superconductivity Research, Department of Physics, University of Maryland, College Park, MD 20742 — ZnO is widely considered as the next generation wide-band gap material for optoelectronic device applications due to its excellent material properties. Although in recent years various studies on ZnO crystal have been made, very little is known about its response after thermal treatments. In this work, we studied the influence of thermal annealing on ZnO (0001) bulk single crystal in the temperature range of 30-1000 ^{o}C by elastic resonant ion channeling and Rutherford backscattering (RBS) techniques using a 3.05 MeV He beam. After an isochronal1 h anneal, RBS-Ion channeling analysis showed the evolution of disorder in the Zn sub-lattice of the crystal with increasing annealing temperature. The maximum disorder was observed at 200 ^{o}C above which it decreased. The induced disorder in the Zn sub-lattice at lower temperature ($<$ 400 ^{o}C) can almost be recovered by further annealing above 800 ^{o}C. Elastic resonant ion channeling analysis, which monitors the oxygen in the near-surface region clearly revealed the evolution of thermally induced disorder in the oxygen sub-lattice with increasing temperature. In contrast to the disorder recovery of Zn sub-lattice, the disorder in oxygen sub-lattice did not recover completely. Possible mechanism on the disorder and its recovery will be discussed.

S. Dhar

Date submitted: 29 Nov 2005 Electronic form version 1.4