Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Ferromagnetism and Photoluminescence in Rare-Earth doped GaN via Diffusion M. OLIVER LUEN, N. NEPAL, S.M. BEDAIR, J.M. ZAVADA, Electrical and Computer Engineering, North Carolina State University, Raleigh, NC 27695 USA, EI EI BROWN, U. HOMMERICH, Department of Physics, Hampton University, Hampton, VA 23668 USA, P. FRAJTAG, N.A. EL-MASRY, Materials Science and Engineering, North Carolina State University, Raleigh, NC 27695 USA — Rare-earth doped GaN is attracting attention both as a diluted magnetic semiconductor (DMS) material and for optical devices useful in communications and multi-color semiconductor display technology. GaN's large band gap (3.4 eV) gives rise to optical transparency over a wide spectral range, from the infrared (IR) to the ultraviolet. These properties make it an optimum host for the various emissions that are possible from rare-earth (RE) ions. Recently, rare-earth doped GaN also has demonstrated above room temperature ferromagnetism. In this study, we report the diffusion of RE (Nd, Sm, Gd and Er) into undoped, Mg-doped and Si-doped GaN templates. Room temperature optical and ferromagnetic properties were studied using photoluminescence (PL) and alternating gradient magnetometer, respectively. Ferromagnetic properties show a preference for undoped and n-type GaN. PL spectra exhibit RE ion inner shell transitions in the visible and infrared regions. The mechanisms for above room temperature ferromagnetism and emission intensity related to the RE concentration, is discussed.

Neeraj Nepal
North Carolina State University

Date submitted: 17 Dec 2008 Electronic form version 1.4