Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Epitaxial Growth of Binary Ferromagnetic $Mn_{3-\delta}Ga$ Thin Films on Wurtzite GaN(0001) and Investigation by Atomic Scale Scanning Tunneling Microscopy E.D. LU, R. YANG, M.B. HAIDER, C. CONSTANTIN, A.R. SMITH, Condensed Matter and Surface Science Program, Department of Physics and Astronomy, Ohio University, Athens, OH 45701, J.W. KNEPPER, F.Y. YANG, Physics Department, Ohio State University, 191 Woodruff Avenue, Columbus, OH 43210 — Due to increasing interest in developing new magneto-optical and magneto-electronic devices, and spin injection sources in spintronics applications, ferromagnetic (FM)\MnxGay is an attractive candidate system to explore. Here we report that binary FM $Mn_{3-\delta}Ga(1.14<\delta<2.0)$ single crystalline thin films has been epitaxially grown on (*w*)-GaN(0001)surfaces using molecular beam epitaxy. The face-centered tetragonal structure of $Mn_{3-\delta}Ga$ thin films with CuAu-$L1_0$ type ordering has been determined *in situ* by both reflection high energy electron diffraction and atomic-scale scanning tunneling microscopy. The epitaxial relationship of the $Mn_{3-\delta}Ga$ with GaN(0001) is $(111)[1\bar{1}0]_{MnGa} \parallel (0001)[1\bar{1}00]_{GaN}$ and $(111)[11\bar{2}]_{MnGa} \parallel (0001)[11\bar{2}0]_{GaN}$. The hysteresis loops of the thin films show magnetic anisotropy along *in-plane* and *out-of-plane* directions. It is found that Curie temperature and magnetic moments of the $Mn_{3-\delta}Ga$ thin films are closely related to the Mn content, and the reconstruction changes from 1×1 to 2×2 by increasing the ratio of Mn to Ga during the growth. Thus, we have achieved reconstruction-control of magnetic properties.

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Date submitted: 06 Jan 2006 Electronic form version 1.4