Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Two-dimensional MnGaN Layer formed by Nitridation of Mn $\sqrt{3} \times \sqrt{3}$-R30 structure on Wurtzite GaN (000$\underline{1}$)[1] MENG SHI, ABHIJIT CHINCHORE, Department of Physics and Astronomy, Nanoscale and Quantum Phenomena Institue, Ohio University, Athens, Ohio - 45701, YINHAO LIU, Los Alamos National Lab, Los Alamos, NM 87545, ARTHUR SMITH, Department of Physics and Astronomy, Nanoscale and Quantum Phenomena Institue, Ohio University, Athens, Ohio - 45701 — There has been much interest in dilute Mn-doped GaN as a spintronic material. Recently, it has become of interest to consider the possible advantages of delta-doped magnetic layers, rather than a bulk alloy. Here we investigate experimentally the growth of single Mn-containing layers on top of wurtzite GaN as well as the overgrowth of GaN onto the Mn-containing layer, using a combination of N-plasma molecular beam epitaxy and reflection high energy electron diffraction. Sub-monolayer Mn deposition on GaN(000$\underline{1}$) results in a novel $\sqrt{3} \times \sqrt{3}$-R30 structure [1]. Upon nitrogen plasma exposure, this periodicity is removed; whereas, Mn is found remaining on the surface as measured by Auger electron spectroscopy. Unexpectedly, and in dramatic comparison to tiny lattice constant changes seen for bulk films, we find a huge -3.3 percent surface lattice contraction in both [10$\underline{1}$0] and [11$\underline{2}$0] azimuthal directions. This suggests the possible formation of a Mn0.25Ga0.75N 2-D alloy. Furthermore, subsequent overgrowth of GaN layers does not show significant lattice constant change compared to the nitridation process, up to a thickness of 20 ML or more.

[1] Chinchore et al., Applied Physics Letters **93(18)**, 181908 (2008).

[1]Authors greatfully acknowledge DOE & NSF.

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Date submitted: 22 Nov 2011 Electronic form version 1.4