Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

**MBE and ALD grown High k Dielectrics Gate Stacks on GaN** Y.C. CHANG, K.Y. LEE, W.C. LEE, T.D. LIN, Y.J. LEE, M.L. HUANG, M. HONG, Dept. of Materials Science and Engineering, National Tsing Hua Univ., Taiwan, J. KWO, Dept. of Physics, National Tsing Hua Univ., Taiwan, Y.H. WANG, Dept. of Electrical Engineering, National Cheng-Kung Univ. , Taiwan — III-nitride compound semiconductors are attractive for high-temperature and high-power MOSFET applications due to their intrinsic properties of wide band gap, high breakdown field, and high saturation velocity under high fields. In this work GaN-based high k MOS diodes were fabricated using MBE-grown $Ga_2O_3(Gd_2O_3)$, MBE-grown $HfO_2$ and ALD-grown $HfO_2$ as the gate dielectrics with dielectric constants of 14.7, 17.4 and 16.5, respectively. All MOS diodes exhibited low leakage ($<10^{-6}$ A/cm$^2$ at $V_{fb}+1$) and well behaved capacitance-voltage curves with a low interfacial density of states of $\sim 10^{11}$ cm$^{-2}$eV$^{-1}$. Energy-band diagrams of the MOS structures have been determined by extracting valance-band offset ($\Delta E_V$) from HR-XPS and with the bandgaps of the oxides. For example, the ALD-grown $HfO_2$-GaN at the interfaces gave approximately $\Delta E_C$ and $\Delta E_V$ of 1.2 eV and 1.1 eV, respectively.

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Date submitted: 27 Nov 2006 Electronic form version 1.4