

Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Interfacial-layers-free Ga₂O₃(Gd₂O₃)/Ge MOS Diodes C.H. LEE, T.D. LIN, K.Y. LEE, M.L. HUANG, L.T. TUNG, M. HONG, Department of Materials Science and Engineering, National Tsing Hua University, Taiwan, J. KWO, Department of Physics, National Tsing Hua University, Taiwan — High κ dielectric Ga₂O₃(Gd₂O₃) films were deposited directly on Ge by Molecular-Beam-Epitaxy without the employment of GeON interfacial layer. Excellent electrical properties, such as a high κ value of 14.5, a low leakage current density of only 3×10^{-9} A/cm² at $V_{fb}+1V$, and well-behaved CV characteristics, were demonstrated, even being subjected to a 500°C annealing in N₂ ambient for 5 min. An abrupt Ga₂O₃(Gd₂O₃)/Ge interface without any interfacial layer was revealed by high-resolution transmission electron microscopy as well as *in-situ* x-ray photoelectron spectroscopy (XPS). Detailed XPS studies indicate that the oxide/Ge interface consists of mainly Ge-O-Gd bonding, distinctly different from that of native oxide. Furthermore, the 500°C annealing did not change the chemical bonding, implying a great thermodynamic stability of the hetero-structure. The outstanding electrical and thermodynamic properties qualified Ga₂O₃(Gd₂O₃) as a promising dielectric for Ge and proved the GeON interfacial layer to be unnecessary.

T.D. Lin

Date submitted: 02 Dec 2007

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