

Abstract Submitted
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Energy-band parameters of atomic-layer-deposited Al_2O_3 and HfO_2 on $\text{In}_x\text{Ga}_{1-x}\text{As}$ M.L. HUANG, Y.C. CHANG, Y.H. CHANG, T.D. LIN, M. HONG, J. KWO, National Tsing Hua University, DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING TEAM, DEPARTMENT OF PHYSICS TEAM — X-ray photoelectron spectroscopy (XPS) combined with reflection electron energy loss spectroscopy (REELS) were used to determine the energy-band parameters, valence-band offsets ΔE_V , conduction-band offsets ΔE_C , and energy-band gaps E_g , of the atomic layer deposited (ALD) high k dielectrics of Al_2O_3 and HfO_2 on $\text{In}_x\text{Ga}_{1-x}\text{As}$ ($x=0, 0.15, 0.25, \text{ and } 0.53$). Using REELS, E_g values of the ALD- Al_2O_3 and - HfO_2 were estimated to be 6.77 and 5.56 ± 0.05 eV, respectively. The ΔE_C 's and ΔE_V 's are larger than 1.5 and 2.5 eV, respectively, for all the ALD-oxide/ $\text{In}_x\text{Ga}_{1-x}\text{As}$ samples. The ΔE_c values obtained from the HR-XPS and REELS analyses are in good agreement with those estimated from the electrical measurement according to Fowler-Nordheim tunneling. The results are valuable to the understanding and modeling of the III-V high k MOS devices.

M. L. Huang
Dept of Materials Science and Engineering, National Tsing Hua University

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