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***In-situ* photoemission analyses of ALD-oxide/$In_xGa_{1-x}As$ (001) interfaces** M.L. HUANG, Dept. Phys., Natl Tsing Hua Univ., Hsinchu, Taiwan, Y.H. CHANG, Dept. Mat. Sci. and Eng., Natl Tsing Hua Univ., Hsinchu, Taiwan, T.D. LIN, Dept. Phys., Natl Taiwan Univ., Taipei, Taiwan, W.C. LEE, Dept. Phys., Natl Tsing Hua Univ., Hsinchu, Taiwan, T.H. CHIANG, Dept. Mat. Sci. and Eng., Natl Tsing Hua Univ., Hsinchu, Taiwan, C.A. LIN, H.Y. LIN, Dept. Phys., Natl Tsing Hua Univ., Hsinchu, Taiwan, T.-W. PI, Natl Synchrotron Rad. Res. Ctr, Hsinchu, Taiwan, M. HONG, Dept. Phys., Natl Taiwan Univ., Taipei, Taiwan, J. KWO, Dept. Phys., Natl Tsing Hua Univ., Hsinchu, Taiwan — High-κ dielectrics on high carrier mobility channels, such as $In_xGa_{1-x}As$, are now being considered for CMOS technology beyond 15 nm node. The initial bonding of high-κ/InGaAs determines the value and the distribution of interfacial density of states (D_{it}) within the $In_xGa_{1-x}As$ band gap, key to the device performance. In this work, atomic layer deposited (ALD) HfO_2 and Al_2O_3 on MBE-grown $In_xGa_{1-x}As$ (001) have been *in-situ* and *ex-situ* carried out to investigate the initial stage of interfacial reactions by high resolution photoemission spectroscopy using synchrotron radiation and monochromatic Al Ka x-ray sources. Comparing the results with the corresponding electrical measurements (C-V and G-V at various temperatures), Fermi level unpinning in the oxide/$In_xGa_{1-x}As$ hetero-structure may be attributed to the exclusion of the As-As and the As-O bonding during the initial interfacial formation.

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