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***In-situ* MBE and ALD deposited HfO_2 on $In_{0.53}Ga_{0.47}As$[1]** W.C. LEE, C.A. LIN, M.L. HUANG, J. KWO, Dept. Phys., Natl Tsing Hua Univ., Hsinchu 30013, Taiwan, Y.H. CHANG, P. CHANG, Dept. Mat. Sci. and Eng., Natl Tsing Hua Univ., Hsinchu 30013, Taiwan, T.D. LIN, M. HONG, Dept. Phys., Natl Taiwan Univ., Taipei 10617, Taiwan — The semiconductor industry is calling for innovative devices offering high performance with low power consumption. High-κ dielectrics/metal gates on high carrier mobility channels are now strong contenders in the post Si CMOS application. Hafnium-based oxide has been employed as the gate dielectric in Si CMOS since 45 nm node and InGaAs is a leading candidate for channel materials. However, reports of HfO_2 on InGaAs are scant, and surface treatments using H_2S or trimethylaluminum are claimed to be required for achieving high quality HfO_2(high-κ)/InGaAs interface. In this work, HfO_2 has been *in-situ* deposited on n- and p-$In_{0.53}Ga_{0.47}As$ using both molecular-beam-epitaxy (MBE) and atomic-layer- deposition (ALD), without using any interfacial passivation layer or surface treatments. The $HfO_2/In_{0.53}Ga_{0.47}As$ metal-oxide-semiconductor capacitors (MOSCAPs) all exhibit outstanding thermal stabilities ($> 800^\circ$C), low leakage currents ($\sim 10^{-8}$ A/cm^2 at 1 MV/cm), and good CV characteristics. Moreover, the MOSCAPs have shown spectra of interfacial trap densities (D_{it}'s) with no discernible peaks at mid-gap, confirmed by temperature-dependent conductance method.

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- [x] Prefer Oral Session
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