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Reduction and desorption of native oxides on GaAs and Ge during atomic layer deposition of Al_2O_3 HANG DONG LEE, TIAN FENG, LEI YU, DANIEL MASTROGIOVANNI, ALAN WAN, TORGNY GUSTAFSSON, ERIC GARFUNKEL, DEPARTMENTS OF PHYSICS AND CHEMISTRY, AND LABORATORY FOR SURFACE MODIFICATION, RUTGERS UNIVERSITY TEAM — The reduction of native oxides and control of interfacial defects is of central importance if materials such as GaAs and Ge are to be used for post-Si CMOS. We and others have earlier observed that under certain conditions such oxides are removed during atomic layer deposition (ALD) growth. We find, using medium energy ion scattering spectroscopy (MEIS) and XPS, that after just a single ALD half cycle (exposure to a trimethylaluminum (TMA) precursor) ∼65% of the native oxide is removed and a 5 Å oxygen-rich aluminum oxide is formed. The source for the oxygen in the aluminum oxide is therefore the native oxide. For Ge substrates, one single TMA pulse removes a substantial amount of the native oxides and a 3Å Al_2O_3 film is grown. The native oxides are also completely removed after $> 450\ ^\circ$C preheating of the substrate. The mechanisms for these processes will be discussed.

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