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Synchrotron Photoemission Characterization of Process Dependent Oxidation Control in InGaAs/High-k Film Systems CONAN WEILAND, JOSEPH WOICIK, National Institute of Standards and Technology, JIMMY PRICE, PAT LYSAGHT, JEFF HUANG, SEMATECH — To continue CMOS scaling, higher mobility substrates, such as III-V semiconductors, are being investigated. However, certain technological barriers must be overcome before high-mobility devices can be employed; notably, defects at the semiconductor/high-k interface need to be well controlled. Here, we investigate the role of an AlN interlayer between InGaAs and ALD ozone deposited ZrO2 using synchrotron source X-ray photoemission spectroscopy (XPS). XPS is able to quantify the relative levels of oxidation from the In, Ga and As signals. Also, by comparing the relative As 3d3/2: As 3d5/2 peak intensities, it is possible to quantify the level of As-As bond formation, which is common to coarse As-O reduction processing and consistent with mobility degradation. To elucidate the role of the AlN interlayer, XPS spectra of InGaAs/AlN/ZrO2, InGaAs/ZrO2 and InGaAs/AlN films will be presented and compared. We will demonstrate that an AlN interlayer is effective in reducing In, Ga and As interfacial oxides, as well as As-As bonding, yet is not sufficient to passivate the interface against further oxidation from ozone based ALD processing.

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