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Correlating Three Liquid Contact Angle Analysis (3LCAA), High Resolution Ion Beam Analysis (HR-IBA), and X-Ray Photoelectron Spectroscopy (XPS) to Optimize GaAs Native Oxides as a Function of Surface Processing SHAURYA KHANNA, AMBER CHOW, NIKHIL SURESH, SUKESH RAM, AASHI GURIJALA, SHAWN WHALEY, ROBERT CULBERTSON, NICOLE HERBOTS, Arizona State University, KAREN KAVANAGH, Simon Fraser University, SIO2 INNOVATES TEAM, ARIZONA STATE UNIVERSITY TEAM — Native oxides inhibit opto-electronic epitaxial growth, making their understanding and removal key. In this work, while HR-IBA accurately determines oxygen coverage, XPS detects modifications in the chemical bonding of GaAs oxides to correlate with changes in surface energy and hydro-affinity through 3LCAA. 3LCAA, total surface energy, γ^{T}, is determined from Lifshitz-Van der Waals, electron donors, and electron acceptors via van Oss-Chaudhury-Good theory. GaAs changes from hydrophobic γ^{T} = 33 1 mJ/m^2 to highly hydrophilic γ^{T} = 66 1 mJ/m^2 after etching.IBA combines <111>channeling with oxygen nuclear resonance to measure monolayer oxygen coverage by matching SIMNRA simulation to spectra. GaAs oxygen coverage decreases after etching from 7.2 0.5 ML to 3.6 0.5 ML with no stoichiometric change in GaAs. is used to measure oxidation of Ga and As as $GaAsO_4$, Ga_2O_3, As_2O_3, and As_2O_5 on two different spots in each wafer. Relative proportions of Ga 3d and As 3d are unaffected by carbon contamination.

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