Abstract Submitted
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Interphase Formation in Nano-Bonding of GaAs to Si in air at low T via Surface Energy Engineering, using Surface Acoustic Wave Imaging, Microscopy, XPS, and Ion Beam Analysis AASHI GURIJALA, NIKHIL SURESH, AMBER CHOW, SHAURYA KHANNA, MOHAMMED SAHAL, Arizona State University, SUKESH RAM, Yale University, TIMOTEO DIAZ, MICHELLE BERTRAM, CHRISTIAN CORNEJO, WESLEY PENG, THILLINA BALASOORIYA, SIDDHARTH JANDHYALA, PRANAV PENMATCHA, TIMOTHY KARCHER, ROBERT CULBERTSON, Arizona State University, KAREN KAVANAUGH, Simon Fraser University, NICOLE HERBOTS, Arizona State University — Si and GaAs absorb different wavelengths so Integrating GaAs to Si yields efficient solar cells. Nano-Bonding [1] (NB) uses Surface Energy Engineering (SEE) to bond GaAs to Si, reduce native oxides, shift surface energies, SE, and hydro-affinity, H-A, to far-from-equilibrium [1]. Three Liquid Contact Angle Analysis measures SE to +/-1 mJ/m^2 before and after SEE, Ion Beam Analysis O coverage, and XPS chemical composition. After SEE, GaAs, initially hydrophobic in air, becomes super-hydrophilic (shl), while Si, initially hydrophilic in air, becomes hydrophobic (hb). H-A correlates with O coverage, which decreases on GaAs by a factor 2 on shl-GaAs, and As_2O_5: As_2O_3 ratio while the ratio GaAs:Ga_2O_3 remains 6:4. SEE reverses H-A without affecting GaAs stoichiometry. Surface Acoustic Wave Imaging and Microscopy show that GaAs successfully nano-bonds to Si. [1] Int. US Pat. 6,613,677 (2003) 7,851,365 (2005) 9,018,077, 9,589,801 Herbots et al.

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