Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Anti-phase domain suppression and increased electron mobilities in InSb epilayers and quantum wells on off-axis Ge(211) and GeOI(001) substrates[1] MUKUL C. DEBNATH, TETSUYA D. MISHIMA, MICHAEL B. SANTOS, University of Oklahoma, KHALID HOSSAIN, ORIN W. HOLLAND, Amethyst Research Inc. — We report on the molecular beam epitaxy of InSb epilayers and Si δ-doped InSb/$Al_xIn_{1-x}Sb$ quantum wells (QWs) on off-axis Ge(211) and Ge-On-Insulator (GeOI)-On-Si substrates. The high carrier mobilities in n-type InSb and p-type Ge QWs provide a motivation to integrate these structures on a single substrate for an improved CMOS technology. Growth on GeOI substrates may also make possible the integration of InSb infrared detectors with Si transistors. We evaluate the suppression of anti-phase domains (APDs) through analysis of Reflection High-Energy Electron Diffraction (RHEED) patterns obtained during growth on off-axis substrates. The narrowest X-ray rocking curve width is 100 arc sec for a 4.0-μm-thick InSb epilayer. The highest room temperature electron mobilities of a 4.0-μm-thick InSb epilayer and an InSb QW are 64,000 and 23,500 cm^2/V-s for growth on off-axis Ge(211) and GeOI(001) substrates, respectively. We attribute the single-domain RHEED patterns, reduced X-ray rocking curve widths, and increased electron mobilities to the suppression of APDs in the structures grown on off-axis Ge(211) and GeOI(001) substrates.

[1]This work was supported by OCAST and NSF Grant DMR-0520550.

Mukul C. Debnath
University of Oklahoma

Date submitted: 26 Nov 2010 Electronic form version 1.4