Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

AlGaAs quantum-well solar cell junctions on beryllium telluride grown on silicon KEVIN CLARK, EDUARDO MALDONADO, FATIMA AMIR, ROBERT BATE, WILEY KIRK, University of Texas at Arlington — A bandgap combination of 1.7 eV and 1.1 eV offers the highest theoretical efficiency for a series-connected tandem-junction solar cell. The monolithic structure of aluminum gallium arsenide grown on silicon is a natural implementation, but has long-standing crystal-quality challenges such as lattice mismatch and island growth of AlGaAs. We address the growth issues by use of an interlayer of BeTe on silicon. AlGaAs grown on BeTe has a strong tendency for island formation, which is suppressed by low-temperature growth initiation. A barrier for electrical transport at the p-BeTe/p-AlGaAs interface is also reduced by low-temperature growth, and BeTe anneal under arsenic rather than tellurium flux. $Al_{0.15}Ga_{0.85}As$-GaAs multiple quantum-well p-i-n junction structures were grown on both Si/BeTe and GaAs substrates for electrical characterization. In preliminary results, the short-circuit photocurrent J_{SC} and open-circuit voltage V_{OC} is lower in the Si/BeTe based junction than the GaAs based junction, with about twice the fractional reduction of V_{OC} than of J_{SC}. A graded-bandgap emitter structure with different n+GaAs top contact layer thicknesses exhibited J_{SC} reduction less than 15%.

Wiley Kirk
University of Texas at Arlington

Date submitted: 20 Nov 2006 Electronic form version 1.4