Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Band-gap engineering at a semiconductor - crystalline oxide interface KAMYAR AHMADI-MAJLAN, MOHAMMADREZA JAHANGIR-MOGHADAM, Univ of Texas, Arlington, XUAN SHEN, Brookhaven National Laboratory, TIMOTHY DROUBAY, MARK BOWDEN, Pacific Northwest National Laboratory, MATTHEW CHRYSLER, Univ of Texas, Arlington, DONG SU, Brookhaven National Laboratory, SCOTT A. CHAMBERS, Pacific Northwest National Laboratory, JOSEPH H. NGAI, Univ of Texas, Arlington — Abstract: The epitaxial growth of crystalline oxides on semiconductors provides a pathway to introduce new functionalities to semiconductor devices. Key to electrically coupling crystalline oxides with semiconductors to realize functional behavior is controlling the manner in which their bands align at interfaces. Here we apply principles of band gap engineering traditionally used at heterojunctions between conventional semiconductors to control the band offset between a single crystalline oxide and a semiconductor. Reactive molecular beam epitaxy is used to realize atomically abrupt and structurally coherent interfaces between SrZrxTi1−xO3 and Ge, in which the band-gap of the former is enhanced with Zr content x. We present structural and electrical characterization of SrZrxTi1−xO3-Ge heterojunctions for x = 0.2 to 0.75 and demonstrate the band offset can be tuned from type-II to type-I, with the latter being verified using photoemission measurements. The type-I band offset provides a platform to integrate the dielectric, ferroelectric and ferromagnetic functionalities of oxides with semiconducting devices.

Kamyar Ahmadi Majlan
Univ of Texas, Arlington

Date submitted: 12 Nov 2014 Electronic form version 1.4