Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Electrical characterization of SiGeSn grown on Ge substrate using ultra high vacuum chemical vapor deposition MO AHOUJJA, University of Dayton, S. KANG, M HAMILTON, Y.K. YEO, Air Force Institute of Technology, ENP, WPAFB, OH, J. KOUVETAKIS, J. MENENDEZ, Arizona State University — There has been recently considerable interest in growing $Si_yGe_{1-x-y}Sn_x$ alloys for the fabrication of photonic devices that could be integrated with Si technologies. We report temperature dependent Hall (TDH) measurements of the hole concentration and mobility from high quality p-type doped $Si_{0.08}Ge_{0.90}Sn_{0.02}$ layers grown on p-type doped Ge substrates using ultra high vacuum chemical vapor deposition. The TDH measurements show the hole sheet density remains constant at low temperatures before slightly decreasing and dipping at $\sim$ 125 K. It then exponentially increases with temperature due to the activation of shallow acceptors. At temperatures above $\sim$ 450 K, the hole sheet density increases sharply indicating the onset of intrinsic conduction in the SiGeSn and/or Ge layers. To extract the electrical properties of the SiGeSn layer alone, a parametric fit using a multi layer conducting model is applied to the measured hole concentration and mobility data. The analysis yields boron and gallium doping concentrations of 3x10^{17} cm^{-3} and 1x10^{18} cm^{-3} with activation energies of 10 meV and 11 meV for the SiGeSn layer and Ge substrate, respectively. Furthermore, a temperature independent hole sheet concentration of $\sim$5x10^{15} cm^{-2} with a mobility of $\sim$250 cm^2/Vs, which is believed to be due to an interfacial layer between the SiGeSn layer and the Ge substrate, is also determined.

Mo Ahoujja
University of Dayton

Date submitted: 14 Nov 2011 Electronic form version 1.4