Abstract Submitted
for the TSF16 Meeting of
The American Physical Society

Band gap engineering of pseudomorphic $Ge_{1-x-y}Si_xSn_y$ alloys on Ge for photonic applications N FERNANDO, S ZOLLNER, New Mexico State University, R HICKEY, J HART, R HAZBUN, D ZHANG, J KOLODZEY, University of Delaware — Band gap engineering of Ge by controlling strain and alloying with Si and Sn has attracted great interest since a $Ge_{1-x-y}Si_xSn_y$ ternary alloy with two compositional degrees of freedom allows decoupling of the lattice constant and electronic structures. We report the effects of alloying and the strain of the direct and indirect band gaps of pseudomorphic $Ge_{1-x-y}Si_xSn_y$ alloys on Ge using deformation potential theory. The predictions for the compositional dependence of the E_0, E_1 and $E_1 + \Delta_1$ band gaps were validated for pseudomorphic $Ge_{1-y}Sn_y$ alloys on Ge using spectroscopic ellipsometry. The complex pseudodielectric functions of pseudomorphic $Ge_{1-y}Sn_y$ alloys grown on Ge by MBE were measured using ellipsometry from 0.1-6.6 eV for Sn contents up to 11%. Critical point energies were obtained by analyzing the second derivative spectra of the dielectric function of the GeSn epilayers. The band gaps of pseudomorphic $Ge_{1-y}Sn_y$ alloys obtained from ellipsometry are in good agreement with the theoretical predictions.

N Fernando
New Mexico State University

Date submitted: 20 Sep 2016 Electronic form version 1.4