Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Raman Scattering from $Si_{1-x}Ge_x$ Alloy Nanowires QIUJIE LU, KOFI ADU, Department of Physics, The Pennsylvania State University, XI ZHANG, KOK-KEONG LEW, PRAMOD NIMMATOORI, Department of Material Sciences, The Pennsylvania State University, ELIZABETH DICKEY, JOAN REDWING, Department of Material Sciences, Materials Research Institute, The Pennsylvania State University, PETER EKLUND, Department of Physics, Department of Material Sciences, Materials Research Institute, The Pennsylvania State University
— Bulk $Si_{1-x}Ge_x$ crystals can be prepared over a wide composition range 0<x<1. These materials are of interest because alloying can be used to vary the bandgap of the system. Here we present Raman scattering results on $Si_{1-x}Ge_x$ nanowires (0<x<1) grown by the vapor-liquid-solid growth mechanism using a Chemical Vapor Deposition (CVD) approach. TEM and XRD were used to characterize the morphology growth axis and lattice constant of these materials. Typical wire diameters were observed to be in the range 80-130 nm. Based on Raman scattering studies of the bulk, three Raman bands are expected that can be identified as a perturbed Si-Si ($\sim$500 cm^{-1}) mode, a Ge-Ge ($\sim$280 cm^{-1}) mode or a new mode at ($\sim$390 cm-1) assigned to Si-Ge or Ge-Si clusters. Peaks in this region are also observed in the case of our nanowires, although the frequencies are a few cm^{-1} lower than observed in the bulk. We also observe that the compositional (x) dependence of the Si-Ge band in nanowires is somewhat different than in the bulk.

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Date submitted: 20 Nov 2006 Electronic form version 1.4