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Photoluminescence in Strain-Engineered Si/SiGe Three Dimensional Nanostructures NIKHIL MODI, New Jersey Institute of Technology, ECE Department, Newark NJ 07102 USA, LEONID TSYBESKOV, New Jersey Institute of Technology, ECE Department, Newark NJ 07102, USA, DAVID LOCKWOOD, XIAO WU, JEAN-MARC BARIBEAU, National Research Council, Institute for Microstructural Sciences, Ottawa ON, Canada — The effect of strain on the degeneracy of energy band minima in composition-controlled Si/SiGe nanostructures with high germanium content ($\sim 50\%$) is studied by low temperature photoluminescence (PL) spectroscopy, ultra-high resolution transmission electron microscopy and energy dispersive X-ray spectroscopy measurements. PL spectra obtained from selective excitation of the multilayered nanostructures show a reduction in the strained-silicon fundamental energy bandgap and a splitting of energy levels presumably associated with partial removal of two-fold degeneracy of the SiGe valence band. PL kinetics recorded using different excitation wavelengths show dramatically different PL lifetimes, ranging from ~ 2 μs to < 10 ns. We show that it is possible to obtain high quantum efficiency luminescence at 1.3-1.6 μm.

Nikhil Modi
New Jersey Institute of Technology,
ECE Department, Newark NJ 07102 USA

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