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Evaluating Heat Dissipation in Si/SiGe Nanostructures using Raman Scattering SELINA MALA, LEONID TSYBESKOV, New Jersey Institute of Technology, D.J. LOCKWOOD COLLABORATION, J.-M. BARIBEAU COLLABORATION, X. WU COLLABORATION — Bulk SiGe alloys and SiGe nanostructures exhibit relatively low thermal conductivity and have found applications in efficient thermoelectric devices. Practical measurements of thermal conductivity involve a sophisticated device design, which may not be applicable to sub-micrometer structures and devices. Raman scattering can be used to measure local temperature with a high accuracy, and it allows calculations of thermal conductivity. In this work, we present Raman data obtained for three sets of samples: partially-relaxed SiGe alloy layers with thickness close to 50 nm; planar Si/SiGe superlattices (SL) with $\sim$ 30% Ge content; and three-dimensional (3D) Si/SiGe cluster multilayers with different Ge concentration and degrees of vertical self-ordering. Despite a high signal-to-noise ratio (better than 1000 to 1), quantitative analysis of Raman spectra requires proper baseline modeling and subtraction. By measuring multi-modal Stokes/anti-Stokes Raman signals and performing base line correction, we calculate local temperatures and develop a model of heat dissipation in the different SiGe and Si/SiGe nanostructures.

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