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Thermal Transport in Semiconductor Quantum Dot Superlattices[1] ALEXANDER KHITUN, University of California Los Angeles, JIANLIN LIU, University of California Riverside, KANG WANG, University of California Los Angeles — We present a theoretical model allowing us to predict thermal properties in semiconductor quantum dot superlattices (QDS). The model is based on the relaxation time approximation taking into account phonon relaxation due to the scattering on quantum dots. According to the model, the thermal properties of semiconductor QDS can be effectively controlled by quantum dot composition, size and arrangement. Numerical calculations were carried out for a structure that consists of multiple layers of Si with randomly distributed Ge quantum dots separated by spacer layers. The results of numerical simulations are in a good agreement with experimental data obtained for Si/Ge QDS in a wide temperature range (100-300K). The model explains the artificial anisotropy of the thermal conductivity experimentally observed in Si/Ge QDSs. The obtained results are important for the most recently suggested applications of quantum dot superlattices for thermoelectric devices.

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