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Phonon Thermal Conductivity of the Quantum Dot Superlattices
MANU SHAMSA, WEILI LIU, YUN BAO, ALEXANDER BALANDIN, Nano-Device Laboratory (http://ndl.ee.ucr.edu/), Department of Electrical Engineering, University of California, Riverside, CA 92521 — Quantum dot superlattices (QDS) have been proposed for thermoelectric and other device applications [1]. In this paper we present results of our experimental and theoretical investigation of the thermal conductivity in the doped and undoped Ge/Si quantum dots superlattices [2]. We have observed an order of magnitude decrease in the room-temperature thermal conductivity compared to bulk, as well as significant shift of the thermal conductivity peak to the higher temperature values. The thermal conductivity dependence on temperature has been approximated as K$\sim$ $T^{0.7}$ – $T^{0.9}$ in the low-temperature region. We have also carried out modeling of thermal conduction in QDS in order to elucidate the effect of thermal boundary resistance at the interfaces between Si and Ge layers. [1]. A.A. Balandin and O.L. Lazarenkova, Appl. Phys. Lett., **82**, 415 (2003). [2]. W.L. Liu and A.A. Balandin, Appl. Phys. Lett, 85 (2004). This work has been supported by the NSF CAREER and NSF SGER awards to A.A.B.

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