Quantum-dot thermometry applied to the study of electron-phonon interaction in nanowires

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— The thermal properties of mesoscopic devices are greatly influenced by quantum and finite-size effects. For example, the influence of electron-phonon coupling on heat flow through nanowires is different than in bulk materials and has not been studied in detail. One challenging aspect of performing thermal experiments with a mesoscopic device is the application and quantification of a temperature difference across a sub-micron distance. The recently introduced quantum-dot thermometry[1,2] uses a quantum dot to measure the electronic temperature difference across the dot’s dimension. We present here experimental results demonstrating quantum-dot thermometry using a quantum dot embedded in an InAs nanowire. In addition, we show result which suggest that quantum-dot thermometry can be used to measure the strength of electron-phonon interaction in a one-dimensional nanowire.


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