Abstract Submitted
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Thermoelectric Properties of Heterostructure InAs/InP Nanowires ERIC HOFFMANN, University of Oregon, ANN PERSSON, University of Oregon/Lund University, HENRICK NILSSON, LINUS FRÖBERG, LARS SAMUELSON, Lund University, HEINER LINKE, University of Oregon — InAs nanowires with an embedded quantum dot defined by an InP double-barrier structure offer quantum confinement in all three spatial directions. Using a global gate, the Fermi energy can be tuned relative to the dot's density of states. Furthermore, at temperatures below ∼10 K, phonon states freeze out, decoupling phonons and electrons, and electron temperatures can be controlled independent of the lattice temperatures. Due to this control, nanowires at low temperatures lend themselves to detailed investigations of the dependence of thermoelectric effects on a strongly modulated density of states. This is of interest, because such systems have been predicted to be able to convert thermal energy to electrical energy at very high efficiency. We report on experiments where a temperature gradient in the electron gas is created along a single nanowire by heating the metallic lead at one end of the nanowire using an ac heating current. The resulting temperature gradient creates a thermovoltage across the nanowire whose sign and magnitude can be tuned by adjusting the Fermi energy relative to the discrete energy levels in the quantum dot. We find that the thermovoltage depends nonlinearly on the temperature differential at surprisingly small temperature gradients.

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