Abstract Submitted
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Enhancement of thermoelectric efficiency in arrays of InAs/GaAs quantum dots[1] VLADIMIR FOMIN, Institute for Integrative Nanosciences, Leibniz Institute for Solid State and Materials Research, Dresden, Germany , PETER KRATZER, University of Duisburg-Essen, Duisburg, Germany — We investigate the effect of the electron miniband energy spectrum of periodic 1D stacks of self-assembled InAs/GaAs quantum dots (QDs) on their electronic transport characteristics. The electron minibands are calculated within tight-binding and Kronig-Penney models. An explicit evaluation of the transport relaxation time in minibands is provided employing the Boltzmann transport equation. The transport relaxation time reveals a significant dispersion as a function of the wave vector in the stacking direction. From the numerical analysis of the electric and thermal conductivities, the Seebeck coefficient and the figure-of-merit, we conclude that a 1D stack of QDs achieves a geometry-controlled enhanced efficiency as a thermoelectric converter in certain windows of the donor concentration. Engineering the electronic factors in the figure-of-merit requires a fine-tuning of both the geometrical parameters of the stack and the doping.

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