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Size- effect induced high thermoelectric figure of merit in PbSe and PbTe nanowires

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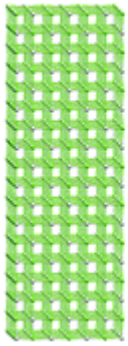
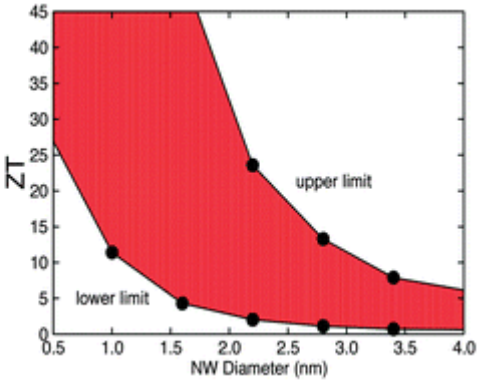
Abstract

The fundamental properties that compose the thermoelectric figure of merit are investigated in the confined systems of PbSe and PbTe nanowires, with the goal to improve the thermoelectric efficiency. Using the Landauer electronic transport theory, we verify that the figure of merit can be several times larger than the bulk value for nanowires with diameters down to the one nanometer scale. This enhancement in the thermoelectric efficiency is primarily due to the reduction of the thermal conductivity and an increase in the power factor. The origin of these desireable properties, that enable the transformation of heat into electricity, comes from the confinement effect which increases the density of states around the Fermi level, either for an n- or p-type system.





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