Thermo-electric transport in nanowires and nanostructures

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Nanowires and nanostructures are interesting platforms to study heat and electric transport in confined systems. Nanowires are promising candidates in the field of thermoelectricity where heat is converted into electricity without any moving parts. A good thermoelectric material exhibits a low thermal conductivity, and high electrical conductivity and Seebeck coefficient. The thermal conductivity in nanowires is reduced compared to bulk due to surface scattering, while Seebeck coefficient is improved by the 1-dimensional density of states.

InSb is the most promising thermoelectric material to study the effects of quantized electronic transport and its effects on the thermoelectric properties. Measurements of the thermoelectric properties of InSb nanowires will be presented. Ballistic phonon transport in GaP nanowires with a length up to 10 micrometers will be presented, which is attributed to specular scattering of phonons on the surface of the nanowires. Finally, the latest results on the search for signatures of Hydrodynamic phonon transport in silicon microstructures studied by CCD thermoreflectance will be shown.