Thermoelectric Properties of Semiconductor Nanostructures

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Thermoelectric experiments on nanostructures are often complicated by the need to apply a temperature difference of a few K across a device a few 100 nm in size. In semiconductors, such large gradients lead to very strong phonon drag effects, that overwhelm the electronic thermoelectric effects a transport physicist usually is interested in.

Over the years, we have developed a current heating technique that utilizes the relatively small electron-acoustic phonon coupling in semiconductors to create a thermal gradient in the electronic system only. This has allowed us to study in detail the thermoelectric properties of quantum point contacts and quantum dots. More recently, we have started to apply the technique to spintronic nanostructures. In this talk, I will present some of our recent results in this direction, with examples such as the thermoelectric properties of a dot in the Kondo regime, thermal rectification and the diffusion thermopower of (Ga,Mn)As.