Prof. Dr. Jairo Sinova
Institut für Physik, SPICE
sinova@uni-mainz.de

JOHANNES GUTENBERG UNIVERSITÄT MAINZ

Theory of Condensed Matter: Hard Condensed Matter

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Cosimo Gorini
Institut für theoretische Physik - Universität Regensburg

Thermoelectric conversion in disordered nanowires

Semiconductors have been employed for decades as the thermoelectric materials of choice. More recently, gated semiconductor nanowires have shown remarkable thermoelectric properties, well beyond those of standard bulk devices, and are under intense experimental investigation. Indeed, nanostructuration allows -- at least in principle -- to engineer systems capable of meeting the somewhat contradictory requirements of an ideal thermoelectric device: (i) to be a good charge and a poor thermal conductor (ii) exhibiting strong particle-hole asymmetry, (iii) which works up to room temperature and (iv) is based on non-polluting and abundant materials.
I will show that strongly disordered nanowires, where conduction takes place via phonon-assisted (Mott) hopping between localised states, act indeed as very promising thermoelectrics. In particular, I will discuss impurity band-edge transport and an asymmetric 3-terminal setup as two complementary approaches to realising flexible and performant (non-local) thermoelectric devices.

Contact:
Hjördis Pusch
hjopusch@uni-mainz.de