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Thermoelectric effects in disordered branched nanowires OLEKSIY ROSLYAK, ANDREI PIRIATINSKIY, LANL — We shall develop formalism of thermal and electrical transport in $Si_{1-x}Ge_x$ and $BiTe$ nanowires. The key feature of those nanowires is the possibility of dendrimer type branching. The branching tree can be of size comparable to the short wavelength of phonons and by far smaller than the long wavelength of conducting electrons. Hence it is expected that the branching may suppress thermal and let alone electrical conductance. We demonstrate that the morphology of branches strongly affects the electronic conductance. The effect is important to the class of materials known as thermoelectrics. The small size of the branching region makes large temperature and electrical gradients. On the other hand the smallness of the region would allow the electrical transport being ballistic. As usual for the mesoscopic systems we have to solve macroscopic (temperature) and microscopic ((electric potential, current)) equations self-consistently. Electronic conductance is studied via NEGF formalism on the irreducible electron transfer graph. We also investigate the figure of merit ZT as a measure of the suppressed electron conductance.

Oleksiy Roslyak
LANL

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