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Strongly enhanced thermal transport in a lightly doped Mott insulator[1] VELJKO ZLATIC, Institute of Physics, Zagreb, JIM FREERICKS, Physics Department, Georgetown University — We discuss the charge and heat transport of a "bad metal" described by the Falicov-Kimball model near half-filling, using DMFT. For a lightly doped Mott insulator, the exact solution gives transport coefficients of a universal form at low, $T \leq T_0$, and high temperatures, $T \geq T_\mu$. These characteristic temperatures are such that, for $T \leq T_0$, transport is not affected by the excitations across the gap and that, for $T \geq T_\mu$, the chemical potential is at the center of the gap. At intermediate temperatures, $T_0 \leq T \leq T_\mu$, the chemical potential moves in the gap and the Wiedemann-Franz law doesn't hold. Here, the increased asymmetry of the electron and hole currents can very much enhance the thermopower S(T) and the figure of merit ZT. At a small doping and U$\gg$1 we find ZT$\geq$100. Above T_μ, the electron-hole symmetry is restored and S(T) drops to small values. For U>1 and moderate doping, there is a broad temperature interval in which ZT>1, even though the electronic thermal conductivity and the effective Lorenz number are not small. In this regime, the phonons might be less adverse to ZT. Large ZT is also obtained for a three-dimensional cubic lattice. Similar effects could not be obtained with non-interacting electrons or a Fermi liquid.

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