Strongly enhanced thermal transport in a lightly doped Mott insulator\textsuperscript{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 $T_\mu$, 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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