We discuss the transport properties of "bad metals", systems with large and often linear high-temperature resistivity which can exceed the Mott-Ioffe-Regel limit. Bad metals are found among many oxides close to the Mott-Hubbard insulating phase and we are interested in the unusual thermoelectric response of these systems. We describe bad metals by a simplified Hubbard model (Falicov-Kimball model) and calculate the transport coefficients by the dynamical mean field theory, which provides a very good description of doped Mott insulators. This simplified model captures also the main features of the incoherent phase of the full Hubbard model.

Our results show that the high-temperature resistivity is a quasi linear function of temperature and that the thermoelectric response depends on the level of hole doping. We find three types of behavior that are clearly seen in the high-Tc cuprates and are, in our view, typical of bad metals. (i) at very low doping (lightly doped Mott insulators) the resistivity $\rho(T)$ and the thermopower $\alpha(T)$ have pronounced low-$T$ peaks that shift to higher-$T$ with doping; (ii) at moderate doping (underdoped samples) $\rho(T)$ is a monotonically increasing function of temperature, linear in a large temperature interval, while $\alpha(T)$ has a small low-$T$ peak that shifts to lower-$T$ with doping and has a high-$T$ sign change; (iii) at the highest doping (overdoped samples) the linear resistivity region is shifted to higher $T$ and $\alpha(T)$ is a monotonic function of temperature which is more negative at higher $T$. We show that the simplified Hubbard model provides an easy to understand description of this phenomenon due to the universal form for the chemical potential versus $T$ for doped Mott insulators and the applicability of the Kelvin formula for the thermopower.