Abstract submitted to the
NATO ADVANCED RESEARCH WORKSHOP
New materials for thermoelectric applications: theory and experiment
September 19 - 25, 2011 Hvar, Croatia

Enhanced thermal transport in strongly correlated multilayers

J. K. Freericks[1], V. Zlatić[2]

[1] *Physics Department, Georgetown University, Washington D.C., USA*

[2] *Institute of Physics, P.O.B. 304, 10000 Zagreb, Croatia*

Submitted : 11-09-2011

We present the results for the charge and heat transport in inhomogeneous multilayered devices with strongly correlated electrons. We consider two devices: (1) for longitudinal transport, we consider metallic leads sandwiching a Mott insulator, and (2) for transverse transport, we consider one Mott insulator surrounded by two different Mott insulators, with thin conducting layers created at the interfaces by the polarization catastrophe. The electron dynamics of the device is described by the Falicov-Kimball model which is solved by an inhomogeneous DMFT algorithm[1]. By varying the parameters in these two systems, we can try to optimize thermoelectric properties by tuning the electronic density of states in the active regions to have a large slope. This procedure is different for the two different modes of current flow.

We calculate the transport properties by linear response theory[2, 3] and, thus, obtain the conductivity, the Seebeck coefficient, the power factor, and the figure-of-merit of the device.

We also discuss effects related to applying external fields to these devices. At first, one needs to evaluate how the electronic charge reconstruction is modified due to the electric field and to understand the many-body effects on the capacitance. Then one needs to determine the effect on the transport. We will give a preliminary discussion of our results here.

[1] Ling Chen and J. K. Freericks, Physical Review B, **75**, 125144 (2007).

[2] J. K. Freericks, V. Zlatić and A.M. Shvaika, Physical Review B, **75**, 035133 (2007).

[3] J. K. Freericks *Transport in multilayered devices: the dynamical mean-field theory approach* (Imperial College Press, London, 2006).