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Thermal transport in strongly correlated nanostructures

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I will discuss longitudinal transport through multilayered nanostructures composed of stacks of planes of different materials. The prototypical device involves metallic leads sandwiched around a barrier composed of a strongly correlated material. The transport changes character as the barrier is tuned through the Mott metal-insulator transition, and one can study the crossover from tunneling behavior to Ohmic (thermally activated) transport. I employ the inhomogeneous version of the dynamical mean-field theory for this analysis, and the charge transport can be well understood by employing a generalized Thouless energy to characterize the behavior. I will also present some preliminary results for thermal transport. In this case, the device must have an electronic charge reconstruction at the interfaces between the barrier and the leads. This reconstruction, similar to the Schottky barrier known in the semiconductor industry, can have interesting effects on Mott insulators, as the change in electron filling can dope the system toward or away from a Mott insulating phase. I will describe how one can determine charge transport in these systems, and will discuss numerical complications that enter when there is charge reconstruction.

Keywords : solitons, nanowires, nanotubes,thermal transport