Thermoelectric effects in carbon nanotube quantum dot in the Kondo regime

D. Krychowski and S. Lipiński

Institute of Molecular Physics, Polish Academy of Sciences
M. Smoluchowskiego 17, 60-178 Poznań, Poland

Thermoelectric effects in a carbon nanotube quantum dot in the Kondo regime are studied by the equation of motion method. The thermopower (TEP) is highly sensitive to the structure of the spectral density near the Fermi edge. For temperatures close to the Kondo temperature TEP approaches a local minimum, which becomes sharper for orbital energies closer to the Fermi level. For higher temperatures TEP increases, but in the temperature range corresponding to charging energy it again drops and achieves significant negative values.

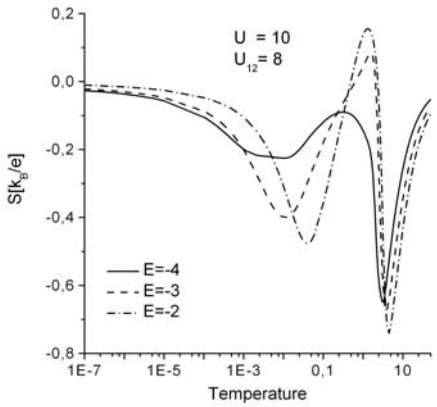

Fig. 1. Linear thermopower S(T) for different level positions E and intra and interorbital Coulomb interactions U = 10 and U_{12} = 8. Coupling between the dot and the leads is chosen as energy unit.

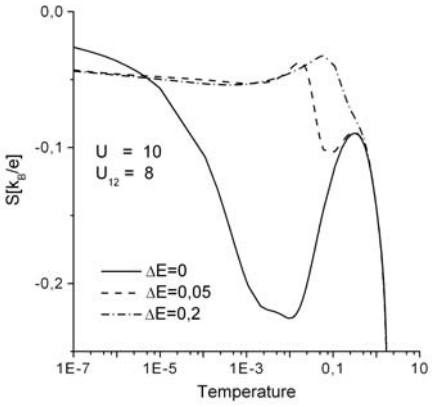

Fig. 2. Linear thermopower S(T) for different level splittings ΔE and E = -4.

We examine the consequences of symmetry breaking of an spin-orbital SU(4) system on thermopower and compare it with corresponding conductance changes. Symmetry breaking can be caused by different reasons. We examine the influence of magnetic field, level mismatch and spin or orbital polarizations of electrodes. Our calculations point on the possibility to control the sign of thermopower in the Kondo regime.

Name of the presenting author (poster session II): Damian Krychowski
e-mail address: krychowski@ifmpan.poznan.pl
http://www.ifmpan.poznan.pl