Nonlinear effects in thermal transport: quantum dot connected with three leads

Marcin Urbaniak,[1] Grzegorz Michałek,[1] and Bogdan R. Bułka[1]

[1] *Institute of Molecular Physics, Polish Academy of Sciences, Poznań, Poland*

We consider thermal transport of electrons through a single-level quantum dot coherently coupled with three electrodes, where one of them is floating. Calculations of charge and heat current are performed by means of non-equilibrium Green functions. We show that flowing currents induce a voltage and temperature in the floating electrode with strongly nonlinear characteristics in the isothermal, isopotential and adiabatic regime. Detailed calculations and analytical expressions of transport coefficients up to the second order are presented. Crossover between the low temperature limit, obtained using Sommerfeld expansion, and high temperature is analyzed. Additionally we present the entropy production in the isothermal, isopotential and adiabatic case. Our studies are motivated by investigations of efficient energy conversion devices in nanoscale.

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