Oscillatory heating in a microchannel at arbitrary oscillation frequency in the whole range of the Knudsen number

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Abstract
The oscillatory heating in a microchannel is investigated on the basis of linear kinetic theory. In particular, the linearized unsteady Shakhov kinetic model, subject to Maxwell boundary conditions is numerically solved in a fully deterministic manner based on finite differencing scheme in the physical space and in the discrete velocity method in the molecular velocity space. The solution of the problem is determined by two parameters: the Knudsen number and the ratio of the intermolecular collision frequency over the oscillation frequency. The numerical calculations are carried out for a wide range of both parameters and results are presented for the amplitude and the phase of all macroscopic quantities of physical interest.