An application of the Chebyshev collocation method for the calculation of a mass flux in a long concentric annular channel. (English) Zbl 07383534 Sib. Èlektron. Mat. Izv. 18, 805-816 (2021)

Summary: A rarefied gas flow through a long concentric annular channel due to pressure gradient is studied on the basis of the linearized BGK model of the Boltzmann kinetic equation using a Chebyshev collocation method. The method is based on the approximation by the truncated Chebyshev series. The linearized BGK model kinetic equation and boundary conditions are transformed into a matrix equation, which corresponds to a system of linear algebraic equations with the values of the unknown function at the Chebyshev collocation points. The mass flux is calculated as a function of the rarefaction parameter. The accuracy of the results is validated in several ways, including the recovery of the analytical solutions at the hydrodynamic and free molecular limits.

MSC:
35Q20 Boltzmann equations

Keywords:
linearized BGK model kinetic equation; model of diffuse reflection; collocation method; Chebyshev polynomials

Full Text: DOI

References:

paper as accurately as possible without claiming the completeness or perfect precision of the matching.