Cylindrical Couette Flow of Rarefied Gas between Two Cylinders Rotating with Different Velocities

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The cylindrical Couette flow of a rarefied gas is studied in the case of two cylinders rotating with different velocities. Velocity, density and temperature profiles are investigated by a Direct Monte Carlo Simulation method and a numerical solution of the Navier-Stokes equations for compressible flow is found. Noting by we have obtained for different values of D (at the variety velocity boundary conditions) numerical results for gas velocity and temperature at the walls. The gas lags or outstrips in comparison with the walls or it has the elastic rigid body behavior. These results are important for applications in non-planar microfluidic problems. The results obtained by both methods are in an excellent agreement at a small Knudsen number Kn = 0.02.

Keywords: Kinetic theory, Rarefied gas, Microfluidics, DSMC

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