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Modeling and Simulation of Molecular Couette Flow in a Wide Range of Knudsen Number LI-SHI LUO, Old Dominion University, WEI LI, Dept. of Math. & Stat., Old Dominion University, Norfolk, USA, ZHAOLI GUO, Huazhong University of Science and Technology, Wuhan, China, JIE SHEN, Dept. of Math., Purdue University, West Lafayette, USA, SHIDONG JIANG, Dept. of Math., New Jersey Institute of Technology, Newark, USA — We consider the planer Couette flow in a wide range of Knudsen number $0.003 \leq k \leq 10.0$. We first solve the integral equation derived from the linearized BGK equation. We then use the molecular dynamics (MD) to simulation the Couette flow with van der Waals interactions between channel walls and molecules. The kinetic solution and the MD are used to construct macroscopic model to simulation the flow. The macroscopic model is based on the lattice Boltzmann equation (LBE) with multiple-relaxation-time (MRT) model for collisions. The proposed MRT-LBE approach is shown to be effective and efficient to simulate molecular gaseous Couette flow in the entire range of Knudsen number.

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