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Direct Simulation Monte Carlo Investigation of Noncontinuum Couette Flow J.R. TORCZYNSKI, M.A. GALLIS, Sandia National Laboratories — The Direct Simulation Monte Carlo (DSMC) method of molecular gas dynamics is used to study noncontinuum effects in Couette flow. The walls have equal temperatures and equal accommodation coefficients but unequal tangential velocities. Simulations are performed for near-free-molecular to near-continuum gas pressures with accommodation coefficients of 0.25, 0.5, and 1. Ten gases are examined: argon, helium, nitrogen, sea-level air, and six Inverse-Power-Law (IPL) gases with viscosity temperature exponents of 0.5, 0.6, 0.7, 0.8, 0.9, and 1.0, as represented by the Variable Soft Sphere (VSS) interaction. In all cases, the wall shear stress is proportional to the slip velocity. The momentum transfer coefficient relating these two quantities can be accurately correlated in terms of the Knudsen number based on the wall separation. The two dimensionless parameters in the correlation are similar for all gases examined. Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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