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Nonlinear and coupling effects on the gaseous Knudsen layer near the solid surface RHO SHIN MYONG, Gyeongsang National University — The Knudsen layer (also known as the kinetic boundary layer) found in the region of a gas flow very close to the solid surfaces plays a critical role in modeling the rarefied and micro-scale gas flows. Although the Knudsen layer has been investigated extensively using kinetic theory in the past, capturing it within the continuum framework, which may provide distinct advantages in terms of computational efficiency, remains a daunting task. In particular, the exact underlying mechanisms behind abnormal behaviors in the Knudsen layer (smaller velocity slip and shear stress, nonlinear velocity profile, velocity gradient singularity, non-zero tangential heat flux) are not understood fully. In this work, those questions associated with the nonlinear and coupling effects in shear stresses and heat fluxes are investigated on the basis of the phenomenological nonlinear coupled constitutive relation (NCCR) and gas-surface molecular interaction model.

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