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Mesoscale Fluctuation-Relaxation Model for Velocity Slip and Temperature Jump on Fluid-Solid Interface[1] JUSTYNA CZERWINSKA, Institute of Fundamental Technological Research — Many micro- and bio-engineering applications require correct prediction of fluid flow in complex geometries. Fluid-solid contact interface prominently influences flow behavior. Velocity slip and thermal jump on the fluid-solid boundary are the result of non-equilibrium intermolecular energy transport. For gases this phenomena is well described by Maxwell-Smoluchowski equation. For liquids, at present simulations are conducted by hybrid approach (Continuum- Molecular Dynamics; Lattice Boltzmann Method - Molecular Dynamics). Presented here Fluctuation-Relaxation model, which is consequence of non-equilibrium Fluctuation Theorem, provides coarse grained relation for intermolecular solid-fluid energy transport. The implementation and verification is obtained by using Voronoi Particle Dynamics. Consequently, velocity slip and thermal jump are the result of the relaxation to equilibrium of the near boundary fluid particles. The model predicts correctly other theoretical and computational results. Moreover it provides extension to understanding of fluid-solid interface behavior on the mesoscale.

[1]National Nanotechnology Infrastructure Network at Harvard

Justyna Czerwinska
Institute of Fundamental Technological Research

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