Department of Mathematics

University of Houston

Scientific Computing Seminar

Prof. Pengtao Yue
Department of Mathematics
Virginia Tech

Thermodynamically consistent modeling of contact angle hysteresis

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1:30 PM- 2:30 PM
Room 646 PGH

Abstract: In the phase-field description of moving contact line problems, the two-phase system can be described by free energies, and the constitutive relations can be derived based on the assumption of energy dissipation. In practice, due to defects on the solid surface, the advancing and receding contact angles may differ, which is known as the contact angle hysteresis. We propose a novel boundary condition for contact angle hysteresis by manipulating the surface energy on solid walls. Our method identifies pinning, advancing, and receding conditions automatically, without the explicit knowledge of contact line velocity or contact angle. More importantly, the formulation still satisfies a dissipative energy law. The same idea can be easily extended to other numerical methods, as long as the generalized Navier boundary condition is used for contact line motion. We will provide some recent results on contact angle hysteresis from both a phase-field method and a level-set method. Code validations and 3D simulations of sliding drops will be presented.