

数学与系统科学研究院

计算数学所学术报告

报告人: 邸亚娜博士(ICMSEC)

报告题目:

Simulations of the development of precursor films in spreading

报告时间: 2007年4月19日(周四)

下午4:00—5:00

报告地点: 科技综合楼三层311

计算数学所报告厅

Abstract:

Using the Cahn-Hilliard phase-field description for immiscible two-phase flows, we have numerically investigated the wetting dynamics, with an emphasis on the

formation and development of a precursor film and the dissipation therein in the early stage of spreading. The long-range van der Waals forces towards the solid, which drives the spreading of the wetting phase into the nonwetting phase, have been explicitly taken into account in the governing equations, which are numerically solved using a finite element method. Our continuum model uses the generalized Navier boundary condition to account for the fluid slipping at the solid surface in the vicinity of the real contact line. The accurate description of the molecular-scale contact-line hydrodynamics allows us to study the early stage of spreading, in which the precursor is formed and developed behind the advancing real contact line if the van der Waals forces are strong enough. In the latter regime, a precursor is formed as the wetting phase spreads out following the real contact line, and a region of appreciable fluid slippage is present in the vicinity of the moving contact line. Numerical evaluation of the energy dissipation shows that nearly all of the loss of interfacial free energy is caused by the viscous dissipation in the precursor film.

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