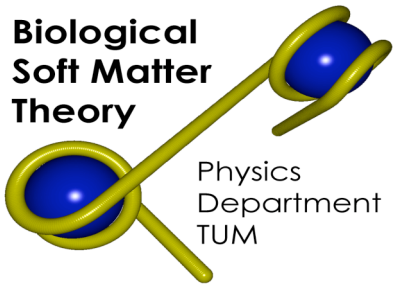

"Soft-Matter Seminar"

Kang Kim

Institute for Moleclar Science, Okazaki 444-8585, Japan

Title:

Simulating Electrohydrodynamic Effects in Charged Colloidal Dispersions

Abstract:

Electrohydrodynamic phenomena are of great importance in physical, chemical, and biological science, and also in several engineering fields. In the case of electrophoresis of charged particles for example, the time evolutions of the colloidal particles, the ions, and the host fluids are described by coupled equations of hydrodynamics (Navier-Stokes) and electrostatics (Poisson) with proper boundary conditions imposed on the surfaces of the colloidal particles. However, the usual numerical techniques of partial differential equations are hopeless to deal with dynamical evolutions of many-particle systems since the moving particle-fluid boundary condition must be treated at every discrete time step.

Recently, we have proposed a reliable and efficient numerical method, called smoothed profile (SP) method, to resolve the hydrodynamic interactions acting on solid particles immersed in host fluids. In the SP method, the original sharp boundaries between colloids and host fluids are replaced with diffuse interfaces with finite thickness. This simple modification greatly improves the performance of numerical computations since it enables us to use the fixed Cartesian grid even for the problems with moving boundary conditions.

In the presentation, we briefly outline our numerical modelling for charged colloidal dispersions and then demonstrate the reliability of the SP method by comparing our numerical results with classical theories such as O'Brien-White theory for electrophoretic mobility.

Donnerstag, den 11.12.2008
16:00 Uhr
Raum PH 3343

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