Dynamics of Electrorheological (ER) Fluid and Electron Transport in Magnetic Multilayers

By

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ABSTRACT:

This talk will focus on the following two parts. The first part is dynamics of Electrorheological (ER) fluid. ER fluid consists of solid particles dispersed in an insulating liquid. Their rheological characters can be varied by applied electrical field. Starting from Onsager principle of minimum energy dissipation, we derive a two-phase electrical-hydrodynamic model for ER fluid dynamics. We consider the energetic dipole-dipole interaction between solid particles in terms of continuum field variable and couple hydrodynamic equation with continuity equation. Our numerical solution of the relevant equations yields prediction that displays very realistic behaviors observed experimentally.

The second part of this presentation is electron transport in noncollinear magnetic multilayers. When a spin current goes through a ferromagnetic metallic layer, the spin current transfers angular momentum to the magnetic layer. The Boltzmann equation is used in the layer-by-layer approach. By including the out-of-equilibrium spin accumulations, we build a self-consistent model for electron transport in noncollinear magnetic multilayers. The current induced spin flip by spin accumulation at the interface allows more spin torque to be generated and less current dispassion. We present a continuous fashion for polarization of the spin current across the interface between magnetic layers.

Date: Wednesday 23 April, 2008
Time: 10.30am to 11.30am
Venue: Math Computation Lab (SBS b2n-02)

Hosted by Prof Alfred Huan