Special Program in Applied Mathematics and Applied Mechanics

Active Colloids

2014 - 10 - 15 (Wed.)
15:00 - 18:00
308, Mathematics Research Center Building (ori. New Math. Bldg.)

Self-propulsion arouses interests among scientists because of its interesting dynamics, physical mechanism, and possible applications, such as micro-swimmer, nano-machine and drug delivery. Several kinds of micro-scale self-propulsions are reported recently in physical systems, such as nano-rods motion in hydrogen peroxide solutions, which uses chemical energy. In contrast to self-propulsion, phoretic motions, including electrophoresis, dielectrophoresis and thermophoresis, described in the linear response theory, are directional motions of objects in given external fields. In this presentation, we report that external fields induce local flows around a colloidal particle and the flow endows the particle with a self-propelled property. By adopting this strategy, we study self-propelled Janus particles driven by induced thermophoresis and induced electrophoresis. Janus particles are known for having two different surfaces in two different sides. In induced thermophoresis, Janus particles irradiated by laser absorb the light at the metal coated side. It creates an asymmetric temperature gradient around the particle. Then the particle moves along the local temperature gradient due to thermophoresis effect. In induced electrophoresis, we study self-propelled Janus particles sandwiched by two transparent electrodes in alternating electric (AC) field. We will discuss the mechanism of the motion for a Janus particle in AC field by induced charge electrophoresis (ICEP). Finally possible relations between chemical powered active colloids and physical powered active colloids will be discussed.

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