



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study : Ph.D.
Thesis Title: Field Induced Motions of Microparticles and Fluids for Mixing, Dye-degradation, Energy Harvesting
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SHORT ABSTRACT

This thesis elaborately explored the movement of microparticles in confined microchannels under electrophoretic and chemophoretic fields. Effect of various parameters like surface heterogeneity, the shape of particle, confinement, and concentration of the solution on the movement of the particle and the hydrodynamics surrounding the particle, when the particle is in motion, have been studied in details. The actual motion of the particle was captured using Fluid Structure Interaction (fsi) module of commercial software COMSOL Multiphysics, which works on finite element based method. Apart from particle motion, electroosmotic motion of electrolytes in a physicochemically and deformable microchannel was another objective of my thesis, where we obtained interesting micromixing exploiting physicochemical patterns and deformability of the channels. Relevantly, the thesis also studied the detailed kinetics of Electric Double Layer (EDL) formation theoretically. In the experimental part of the thesis, it deciphered the detailed kinetics of charge storage capacity in an EDL supercapacitor. Effect of supercapacitor design, material of separation, distance between electrodes on the charge capacity were explored in detail. Importance of different time scales those affect charge storage capacity of a supercapacitor were also identified. In another work from this thesis the study was done on the motion of a multimodal carbon-based '*Janus*' particle, which is capable of moving in different fuels and performing energy harvesting in a PEM Fuel cell and dye degradation.