INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: **INVESTIGATION INTO THE TRANSPORT PHENOMENA OF FERROFLUIDS IN SMALL-SCALE SYSTEMS**

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SHORT ABSTRACT

Ferrofluid is a stable colloidal suspension of iron oxide particles in a non-magnetic carrier fluid. Traditional usage of ferrofluid were limited to multistage rotary seals, exclusion seals, inertia dampers, loudspeakers, etc. However, over the years, ferrofluids have shown promising potential in several applications of emerging relevance, such as biomedical diagnostics, electronic cooling, particle separation, to name a few. In the present dissertation, some issues pertaining to the augmented transport characteristics (mass, momentum, energy) of ferrofluid in the presence of both steady and time-dependent magnetic field are addressed. In particular, the role of the magnetic field on the thermal characteristics of ferrofluid flow has been explored in the first part of the thesis. Subsequently, the internal hydrodynamics of a ferrofluid droplet in the presence of a time-varying magnetic field has been studied in the second part. In the third part, the role of the magnetically modulated internal hydrodynamics of the droplet on the mixing characteristics with a non-magnetic droplet is explored. The last part of the work deals with the explorations of the implication of the convective patterns of the ferrofluid droplet domain when perturbed by a time-dependent magnetic field on its evaporation kinetics. The inferences drawn from the present thesis could be beneficial for the effective design of small-scale real-time engineering systems, typically used in aforementioned applications.