

Ferrofluids, specifically referred to colloidal dispersion of nano-sized magnets of usually about 10 nm, possess large magnetization in the presence of a magnetic field while retaining their fluid properties. In the absence of a field, ferrofluids whose particles are well guarded against agglomeration are considered a subclass of **nanofluids** where there is a restriction on the particle size but no restrictions on the suspension's carrier liquid or the type of dispersed magnetic particles.

Interactions between magnetic nanoparticles when coupled to an applied magnetic/electric field lead to the formation of heterogeneous ordered structures along the field. Formation of the ordered chains or columnar structures is responsible for the change in macroscopic properties of ferrofluids, including thermophysical, rheological, and optical properties while thermodynamic properties such as effective heat capacity remain unaffected.

In this talk, *in-situ* observation of field-assisted structures is briefly reviewed. A structural model to predict in-field thermal conductivity of ferrofluids is proposed and is validated by the experimental data. The model is able to capture the aggregation development of the magnetic particles with increasing magnetic field strength. On the side, and from experimental view point, suitability of commonly used measurement method for the in-field measurements of thermal conductivity will be discussed.