Frederiks transition in nematic tactoids of plate-like colloids

A.A. Verhoeff[a], R.H.J. Otten[b], P. van der Schoot[b],
H.N.W. Lekkerkerker[a]

a Van 't Hoff Laboratory for Physical and Colloid Chemistry, Debye Institute for NanoMaterials Science, Utrecht University, The Netherlands
b Group Theoretical and Polymer Physics, Eindhoven Polymer Laboratories, Eindhoven University of Technology, The Netherlands

Magnetic fields have played an important role in the investigation of liquid crystals. The well-known Frederiks transition in a thin layer of an oriented liquid crystal between two rigid walls, in which there is a competition between the elastic and magnetic free energy, has been used to determine elastic constants of a wide variety of liquid crystals. We investigated by means of polarization microscopy the influence of a magnetic field on the shape and director field of tactoids (nematic droplets in an isotropic medium) in suspensions of colloidal gibbsite platelets. In this case the interfacial tension is also involved. The shape and director field of a tactoid are now determined by an interplay between its bulk elastic, magnetic and interfacial free energy. We will present a simple theory in which we presume strong anchoring and a sphero-cylindrical droplet shape, which allows us to extract values for the interfacial tension and the splay elastic constant from the measured shape and director field deformation.

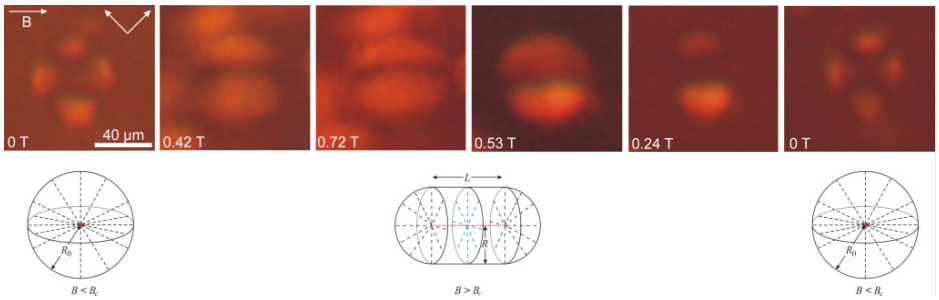

Figure 1: A nematic tactoid of colloidal gibbsite platelets undergoes a shape and director field deformation in a magnetic field.