Stuttgarter Physikalisches Kolloquium

Max-Planck-Institut für Intelligente Systeme
Max-Planck-Institut für Festkörperforschung
Fachbereich Physik, Universität Stuttgart

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Im Werner-Köster-Hörsaal

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Energy Stored in Deformation Fields: Opportunities for Directed Assembly in Soft Matter

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Abstract

Colloidal particles are often directed to assemble by applying electro-magnetic fields to induce interactions and to steer the particles into well-defined structures at given locations. Here, instead, we exploit fields that arise spontaneously when microparticles are placed in contact with deformable matter to direct assembly. In one context, we use capillary interactions that occur between anisotropic microparticles at fluid interfaces. The fluid interface deforms owing to the particle presence, creating an area field that bears the signature of the particle shape and wetting. We discuss migration of disks, spheres and rod-like particles on curved interfaces, and use curvature fields to direct particles to migrate, orient and assemble. In another context, we exploit elastic energies and defect fields that arise in liquid crystals. When a nematic liquid crystal is confined using surfaces with complex topographies and well-defined anchoring energies, the director field and associated defect fields can be molded to store elastic energy which can be used to steer particles into rich assemblies. Related examples for particle migration in smectic films are discussed. In a final context, we study the interaction of colloidal particles on giant vesicles under tension, in which particles are bending energies to interact with each other.