(invited) Directed assembly in soft matter

K J Stebe

University of Pennsylvania, USA

In directed assembly, applied fields are typically used to steer dispersed micro-particles into well-defined structures at given locations. Here, we exploit fields that arise spontaneously when particles are placed in contact with deformable matter. In one context, we use capillary interactions that occur between anisotropic microparticles at fluid interfaces. Energy stored in interfacial deformations and curvature fields can be used to direct particles to assemble with preferred orientations at well-defined locations. Recent results for anisotropic particles on curved interfaces will be discussed.

In another context, we exploit elastic energies and defect fields in confined liquid crystals. For example, by confining a nematic liquid crystal between surfaces with well-defined anchoring energies, the director and associated defect fields can be molded to store elastic energy. We explore this theme using topographically patterned solid surfaces to define defect fields in rings and other structures that steer particles into assemblies mimicking the defect texture, even for particles trapped at interfaces far from the disclination line that sources the migration. Related examples for particle migration in smectic films are discussed.