Nanoscale Directed Self-Assembly in Electrical and Optical Fields
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Directed Self Assembly (DSA): Motivation

Vision2020 Chemical Industry R&D Roadmap for Nanomaterials by Design1 targeted key areas for investment in research that are expected to be critical for the development of emerging nanotechnologies. It defined Nanomaterials by Design as “The ability to employ scientific principles in deliberately creating structures with nano-scale features (e.g., size, architecture) that deliver unique functionality and utility for target applications.” Critical areas requiring the most immediate research attention include robust, controllable, and scalable methods for assembly of functional nanoparticle “building blocks” into devices with emergent properties of technological interest. To directly address these core issues in nanotechnology and nanomanufacturing, we have assembled a team composed of experimentalists and theoreticians/models to develop a scientific knowledge base critical for the successful development of nanotechnological devices based on directed self-assembly (DSA).

DEP Cell and Ellipsoids in Electric Fields

Novel Materials by DEP

Directed Ordering of Particles with Shear Fields

Directed Ordering of Particles with Shear Fields

- Dynamics of shear ordered systems are seen with either rheological or scattering measurements
- Both HCP and FCC ordering is observed
- Scaling follows \( \lambda \sim \omega^{-1} \)
- Shear ordering is applicable over a range of particle sizes
- SEM directly observes shear ordered structures

DEP Assembly and Electrohydrodynamic Mobility of “Janus” Particles

Short Course on Directed Self Assembly
2007 Short Course on Directed Self Assembly was held in conjunction with the 81st ACS Colloid Symposium at the University of Delaware.
- Introduction & Background - Norman J. Wagner
- Self-Assembly - Eric W. Kaler
- Colloidal Interactions and Directed Self-assembly under Electrical Fields - Orin D. Velev
- Optical Tweezers - Eric M. Furst
- Micromechanics of Colloidal Suspensions - John F. Brady

Lecture NOTES are available online: www.nirt.che.udel.edu/

Rohm & Haas Electronic Materials:
“Shear Ordering of Concentrated Particle Suspensions”
Amount: $40,000
Project period: 7/06-8/07

For more information, including publications, www.nirt.che.udel.edu/
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