

Nanoscale Directed Self-Assembly in Electrical and Optical Fields

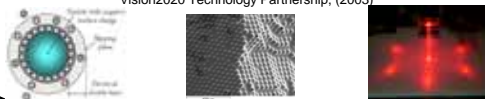
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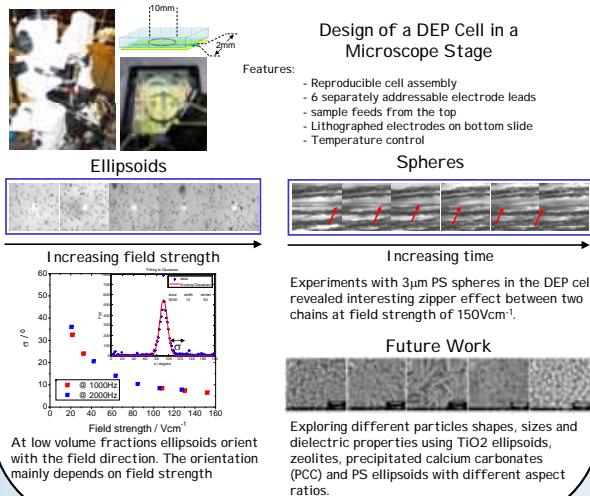
Directed Self Assembly (DSA) : Motivation

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/modelers to develop a scientific knowledge base critical for the successful development of nanotechnological devices based on **directed self-assembly (DSA)**.

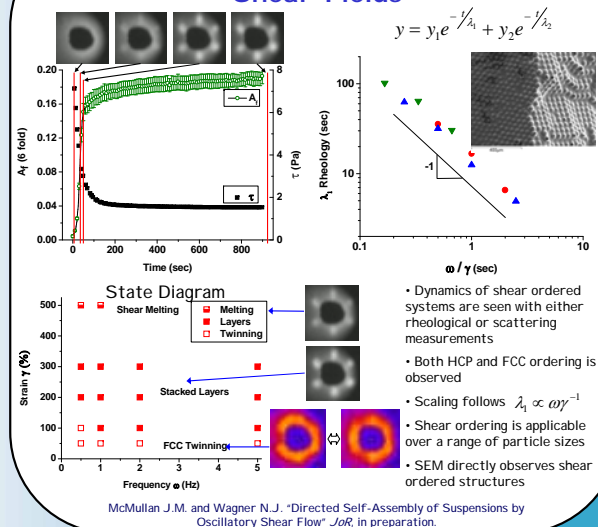
(1) <http://www.chemicalvision2020.org/nanomaterialsroadmap.html> "Chemical Industry R&D Roadmap for Nanomaterials By Design: From Fundamentals to Function", Chemical Industry Vision2020 Technology Partnership, (2003)



DEP Cell and Ellipsoids in Electric Fields Novel Materials by DEP



Directed Ordering of Particles with Shear Fields



Broader Impacts: Outreach

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** - Orlin D. Velev
- **Optical Tweezers** - Eric M. Furst
- **Micromechanics of Colloidal Suspensions** - John F. Brady

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



Broader Impacts: Collaborations

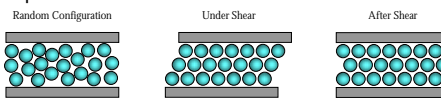
Sandia National Laboratories:

"Optical Trapping for Directed Self-Assembly":
Amount: \$375,000
Project period: 3/1/07-2/28/10:
The project is a NINE LDRD with Anne Grillet as the program director and Dan Rader as program manager. Strategic partners include Eric Dufresne, Yale University.



Rohm & Haas Electronic Materials:

"Shear Ordering of Concentrated Particle Suspensions"
Amount: \$40,000
Project period: 7/06-8/07



For more information, including publications,

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DEP Assembly and Electrohydrodynamic Mobility of "Janus" Particles

