Colloid Science and Nanoscale Engineering Course (CHE 596-009)

Orlin Velev, Department of Chemical and Biomolecular Engineering, NCSU

Synopsis

The Colloid Science and Nanoscale Engineering Course discusses the principles and presents a broad interdisciplinary outlook in the areas of nanotechnology, innovative industrial products, bioarrays, sensors and microdevices. This course begins with an in-depth coverage of the fundamentals of colloidal interactions between surfaces, particles, surfactants and biomolecules, and their relevance to self-assembly. The theory and practice of particle characterization by scattering methods and their manipulation by external fields are presented. In the second part of the course, emerging colloid-related technologies in microfluidics, micropatterning, bioarrays and nanostructured materials are presented. Newly added material this year will focus on the emerging field of soft robotics.

Colloid science has for long provided the fundamentals of a wide range of practically important processes such as foam, emulsion and suspension stability, detergency, separations and product formulation. Vast areas of application of colloid science are currently being opened by the developing technologies of microfabrication, microfluidics, bioarrays and nanotechnology. This course presents ways to apply the colloidal fundamentals to the engineering on the nanoscale. Future progress in these areas will allow such engineering similarly to the way process engineering is presently done for larger scale units and operations.

The course is useful for students and scholars who want to understand the principles and practice of colloids, soft matter and nanoscience. The attendees should have intermediate level knowledge of thermodynamics and/or physics. The course will include discussions, attendee presentations and other interactive activities.

Additional details:
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Fall 2014, Tue & Thu, 12:50-2:05 PM

Also offered through NCSU Engineering Online

http://engineeringonline.ncsu.edu/

Contents - CHE 596-009

Colloid Science

Surface tension, contact angles, wetting

Surfactants, self-assembly and detergency

Intermolecular and surface forces, DLVO theory

Interactions between biological molecules

Manipulation of colloids and biocolloids with external fields, optical and scattering methods

Nanoscale engineering

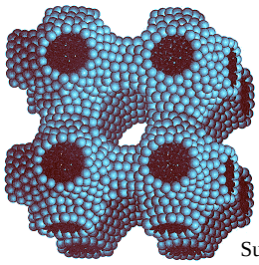
Microfluidics and lab-on-a-chip devices

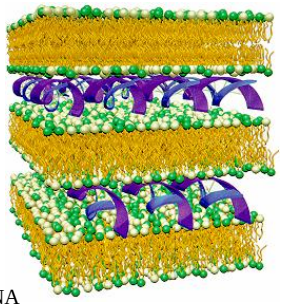
Bioarrays and biosensors

Nanoparticles and nanostructured materials

Microstructures with photonic and electronic functionality

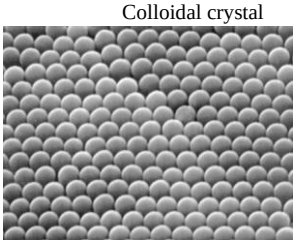
Soft robotics and ionic electronics



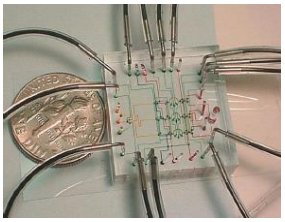


Surfactants, lipids, and DNA

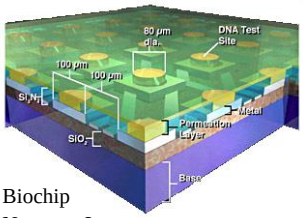
Colloidal crystal



Microfluidics



Photonic device, Joannopoulos, MIT



Biochip Nanogen Inc.