Colloid Science and Nanoscale Engineering Course

Orlin Velev

Guest Professor from the Department of Chemical and Biomolecular Engineering
North Carolina State University, USA

Wed. 4:00 to 6:00 PM & Fri. 4:00 to 5:00 PM, Beg. 22/10/2010
Room C 074 – TUB Chemistry Building

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. Ways to apply the colloidal fundamentals to the engineering on the nanoscale are discussed.

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. Future progress in these areas will allow engineering on the nanoscale 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 use colloids and nanoscience in their research or future practice. The attendees should have intermediate level knowledge of thermodynamics and/or physics. The course will include a number of discussions, attendee presentations and other interactive activities.

Additional details:
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odvelev@ncsu.edu

Contents

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

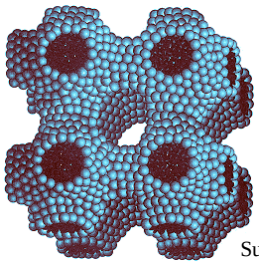
Nanoscale engineering

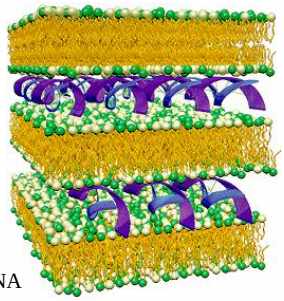
Microfluidics and lab-on-a-chip devices - principles and applications

Bioarrays and biosensors - principles

Nanoparticles and nanostructured materials

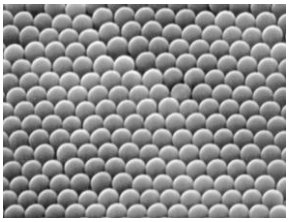
Microstructures with photonic and electronic functionality



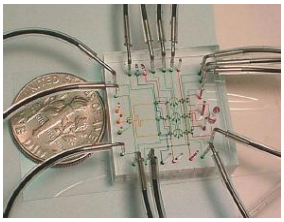


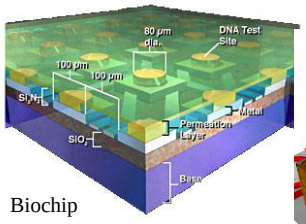
Surfactants, lipids, and DNA

Colloidal crystal



Microfluidics





Biochip
Nanogen Inc.

Photonic device,
Joannopoulos, MIT