SK2774 Colloids and Colloidal Principles for Applications 7.5 credits

Kolloider och kolloidala principer för tillämpningar

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Engineering Physics

Specific prerequisites

English B / English 6

Bachelor's degree in Physics, Electrical Engineering, Materials science, Chemistry or equivalent, including courses in mathematics corresponding to at least 20 ECTS credits and courses in physics corresponding to at least 30 ECTS credits.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After the course, the student should be able to:

- Explain different types of colloids and their basic properties including agglomeration, rheology, association colloids, foams, etc.
- Explain how colloidal stability affects applications in real products
- Describe the fundamental forces that govern surface interface phenomena
- Use the most common measurement methods and equipment in colloidal science

Course contents

Colloid chemistry is the oldest branch of chemistry predating even alchemy. However, the knowledge base of colloid chemistry began to fade from the chemistry curriculum and has only recently had a resurgence due to the importance of nanoparticles. The importance of the basic science of colloid chemistry will be briefly reviewed. Optical experiments (absorption, fluorescence, time-resolved fluorescence, dynamic light scattering etc.) can now be used to elucidate the surface coverage and electrostatic properties of nanoparticles.

Colloids and colloidal principles are widespread in daily life, in nature and technical application. Why is milk white and some tooth pastes transparent? What are colloids and what is their behaviour? Colloids are mixtures of different phases and diverse and complex appearance. What can we expect of such systems, how can we use their properties and how can we use their properties. With lots of examples from the daily life in the area of materials and of food, with key experiments, this lecture concerns the interdisciplinary and very broad topic of the colloids.

Main contents are:

- Colloidal (nano) Particles
- Intermolecular Forces and Van der Waals Forces between Colloidal Particles
- Surfaces and Interfaces in colloidal systems including Surface Tension and Interfacial Tension
- Wetting on Surfaces including wetting in Porous Media including contact angles and dynamic wetting
- Electrical Phenomena at Interfaces like Electrical Double Layer, Electrokinetic Measurements and Interaction of double layers
- Colloidal Stability and Kinetics of Coagulation

Examination

- ANN1 - Project and quiz, 2.5 credits, grading scale: P, F
- TEN2 - Oral exam, 5.0 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Other requirements for final grade

- ANN1 - Project and Assignments, 2.5, grade: P
- TEN1 - Examination, 5.0, grade: A-E

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.