Module P 103: Colloids and Surfaces

Learning objectives:

The course will provide knowledge about advanced physical chemistry of colloids i.e. phase behaviour, structure formation, and dynamics in microemulsions; properties of nanoparticles, block copolymer micelles, and formation of mesoscopic crystals. Also properties of interfaces, smart surfaces, confinement effects in thin films and wetting phenomena will be presented.

Course units and temporal allocation:

Module P 103 ‚Colloids and Surfaces' is comprised of the following course units:

	HPW	Semester
Lecture	2	WS
Laboratory Course	6	WS

This module will be offered by lecturers of Physical Chemistry

Course content:

The ***lecture*** will cover: Phase behaviour of binary and ternary mixtures of water, oil, and amphiphiles. Amphiphiles can be surfactants, lipids, block copolymers, and colloids. The Helfrich concept of the bending elastic energy will be introduced. Moreover, mixed polymer surfactant systems will be treated. The scattering techniques which are relevant for these bulk systems will be briefly discussed (e.g. SANS). This part will be followed by a section about surfaces with an emphasis on thin polymer films and polyelectrolyte multilayers. The relevant experimental techniques will be introduced such as scanning force microscopy (AFM), scanning tunneling microscopy (STM), scanning near-field optical microscopy (SNOM) and ellipsometry.

In the ***laboratory course*** the students will deal with synthesis and characterization of colloidal particles using microscopic techniques and light scattering methods. Moreover, the phase behaviour of a ternary system (surfactant/oil/water) will be investigated using small angle X-ray scattering. Finally colloids or polyelectrolytes will be assembled at surfaces and interfaces. The resulting structures are characterized using methods such as AFM and ellipsometry.

Entrance requirements:

none

Assessment:

A written (or oral) examination on the contents of the lecture and the laboratory course after the first semester. This amounts to 60% of the final grade. A second grade is given for the laboratory course and amounts to 40% of the final grade. The kind of examination (written or oral) and the date are given at the beginning of the semester.

Work load:

In addition to the 2 HPW for the lecture 1 hour is planned for individual studies. Accordingly, 3 additional hours are necessary for the preparation of the experiments and the protocol of the 6 HPW laboratory course. Given 15 weeks per semester this adds up to 180 hours. Together with 30 hours for the preparation of the final examination a work load of 210 hours for the whole semester is calculated.

ECTS Credit Points: 7