Summary
Acquire an understanding of interfacial phenomena and of micro-heterogeneous colloidal solution systems.

Content

1. Thermodynamics of interfaces
   Interfacial tension and surface thermodynamic functions, Laplace pressure, spreading and wetting, contact angle (Young-Dupré equation), capillary ascension, vapor pressure of curved interfaces (Kelvin equation).

2. Colloids/Micelles

3. Solid/gas and solid/solution adsorptions

4. Electrokinetic phenomena
   Zeta potential, electro-osmosis and electrophoresis, streaming and sedimentation potentials.

5. Interfaces
   Stability of colloids according to the DLVO model. Membrane potential, Goldman's equation.

6. Light scattering by colloids
   Rayleigh equation, absorption and scattering cross sections. Determination of the size of particles by light scattering.

7. Characterization of interfaces by microscopy
   Introduction to scanning tunnelling microscopy (STM) and atomic force microscopy (AFM).

Keywords
Surface tension.
Micelles.
Adsorption.
Isotherms.
Electrokinetic phenomena.

Learning Prerequisites
Recommended courses
Thermodynamique I & II.
Electrochimie des solutions.

Important concepts to start the course
Thermodynamic functions.
Charged interface, Gouy-Chapman model of the double layer.

Learning Outcomes
By the end of the course, the student must be able to:
• Formulate the thermodynamic definition of the surface tension
• Derive the equations related to the surface tension (Young-Laplace, Kelvin, etc.)
• Establish Gibb's adsorption equation
• Discuss the properties of surfactant solutions
• Derive the expressions of the adsorption isotherms
• Derive the equations relative to the electrokinetic phenomena
• Discuss the stability of colloids according to the DLVO model
• Discuss the scattering of light by small particles

Transversal skills
• Use a work methodology appropriate to the task.
• Assess one's own level of skill acquisition, and plan their on-going learning goals.

Teaching methods
Ex cathedra lectures and exercises

Expected student activities
Reading the lecture notes and solving the exercises

Assessment methods
Written examination.

Supervision
Office hours No
Assistants Yes
Forum No

Resources
Bibliography
See lecture notes.

Notes/Handbook
Lecture notes

Websites
• http://scgc.epfl.ch/telechargement_cours_chimie