

CH-341 **Physical chemistry of interfaces**

Beck Rainer D.

Cursus	Sem.	Type
Chemistry and chemical engineering	BA4	Obl.
HES - CGC	E	Obl.

Language of teaching	English
Credits	3
Session	Summer
Semester	Spring
Exam	Written
Workload	90h
Weeks	14
Hours	3 weekly
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Summary

Acquire an understanding of interfacial phenomena, micro-heterogeneous colloidal solution systems and dynamic electrochemistry.

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

Gibbs adsorption equation, solutions of amphiphile molecules (surfactants), hydrophobic effect, micelle formation, critical micellar concentration. Monomolecular Langmuir-Blodgett films.

3. Solid/gas and solid/solution adsorptions

Langmuir, Fowler-Guggenheim and BET isotherms. Adsorption of gases on porous solids, capillary condensation in mesoporous particles.

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. Dynamic electrochemistry

Redox potentials, Nernst equation, mass transport, chronoamperometry, voltammetry, Butler-Volmer equation, three-electrode measurements

Keywords

Surface tension.
 Micelles.
 Adsorption.
 Isotherms.
 Electrokinetic phenomena
 Colloidal stability
 Membrane potential
 Dynamic electrochemistry

Learning Prerequisites

Recommended courses

Thermodynamique

Learning Outcomes

By the end of the course, the student must be able to:

- Formulate Formulate the thermodynamic definition of the surface tension
- Derive Derive the equations related to the surface tension (Young-Laplace, Kelvin, etc.)
- Establish Establish Gibb's adsorption equation
- Discuss Discuss the properties of surfactant solutions
- Derive Derive the expressions of the adsorption isotherms
- Derive Derive the equations relative to the electrokinetic phenomena
- Discuss Discuss the stability of colloids according to the DLVO model
- Formulate Formulate models and methods in dynamic electrochemistry

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

Lectures and exercices.

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**

Handouts and exercises.