PHYSICO-CHIMIE DES SURFACES ET DES INTERFACES

PHYSICAL CHEMISTRY OF SURFACES AND INTERFACES

Lecturers: Denis MAZUYER, Juliette CAYER-BARRIOZ

| Lecturers : 8.0 | TC : 8.0 | PW : 0.0 | Autonomy : 4.0 | Study : 8.0 | Project : 4.0 | Language : MI

Objectives

This course covers the fundamentals properties of liquid or solid surfaces and interfaces. From a unified overview of intermolecular forces, a physical description of the liquid state and of complex systems where matter is in a highly divided state such as surfactants aggregates, solutions or dispersions is presented. They are characterized by the creation of extremely high surface / volume ratios. The control of the physico-chemical properties of these interfaces is necessary, at molecular scales to optimize their manufacturing and to monitor their functions, from biotechnology to civil engineering. These concepts are applied to the behavior of objects such as living tissue, cosmetics, paints and processes such as coating, detergency or therapeutic targeting.

Keywords : Surface energy, intermolecular forces, interfaces, wetting, colloids

Programme

I. Intermolecular and surface forces: Polarization and Van der Waals forces, Solvatation forces, Electric double-layer (DLVO)
II. Solid/liquid interfaces: Surface energy and adhesion, Wetting and capillarity, Spreading of thin liquid films
III. Adsorption and surface modifications, Self-assembled systems and Langmuir films, Polymer interfaces
IV. Micelles, emulsions et foams: Surfactants and micellar systems, Stability of colloids, Flows, molecular structure and their interactions

Learning outcomes

- Understand the key concepts of adhesion and surface energy
- Know and apply the main intermolecular forces, the laws of wetting, capillarity and adsorption
- Be able to implement a design approach for colloidal systems and analysis of their properties

Independent study

Objectifs : Make links between the concepts covered in class and tackle new knowledge not treated in class

Méhodes : Problem-based learning methods, real cases studies and oral presentations

Core texts

J.N. Israelachvili, *INTERMOLECULAR FORCES*, Elsevier, 2011
H.-J. Butt, K. Graf, M. KappL *PHYSICS AND CHEMISTRY OF INTERFACES*, Wiley, 2006
P.-G. De Gennes, F. Borchard-Wyart, D. Quéré*GOUTTES, BULLES, ONDES ET PERLES*, Belin, 2005

Assessment

Final mark = 50% Knowledge + 50% Know-how
Knowledge = 100 % final exam
Know-how = 100% continuous assessment