



## 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 of the 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 molecular aggregates, molecules in solutions or particles in suspension, 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 submicrometric or even molecular scales to optimize their manufacturing processes and to monitor their use properties, in various fields from biotechnology to civil engineering. These concepts will be applied to the behavior of (synthetic or natural)

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

#### Programme

- I. Intermolecular and surface forces
  - Polarization and Van der Waals forces
  - Solvation forces
  - Electric double-layer (DLVO)
- II. Solid/liquid interfaces
  - Surface energy and adhesion
  - Wetting and capillarity
  - Spreading of thin liquid films

#### 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

**Méthodes :** 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  
J.-M. Di Meglio *LES ÉTATS DE LA MATIÈRE, DE LA MOLÉCULE AU MATÉRIAU*, Dunod, 2001, 2001

#### Assessment

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