

**MATIÈRE MOLLE : NANOSYSTÈMES ET INTERFACES BIOLOGIQUES****SOFT MATTER****Lecturers:** Denis MAZUYER

| Lecturers : 16.0 | TC : 0.0 | PW : 4.0 | Autonomy : 0.0 | Study : 8.0 | Project : 0.0 | Language : MI

Objectives

Many complex molecular systems (synthetic or natural) are used, in low concentration, to control functions such as detergency, coating capability, anti-icing, therapeutic targeting, ... by giving a very strong response to a very weak control signal (electrical, mechanical, thermal). These technologies are based upon a strong state of division of matter giving large interfaces between immiscible liquids or between solid and liquids. The aim of the course is to present the fundamental processes governing the dynamics state of matter called "colloidal" state and to understand the physicochemical and rheological properties of common objects (lubricants, drugs, food, cosmetics, paints, cells.) in variable applications ranging from biotechnology to civil engineering.

Keywords : Wetting, adhesion, rheology, colloids, biotechnology, physico-chemistry of interfaces, solution of polymers, self-assembly

Programme

- I. The colloidal state: Definition, classification, main properties and characterization methods, Self-assembled molecular systems
- II. Colloidal physico-chemistry: Dispersions, emulsions and biomedical aspects, Colloids for diagnosis and in biotechnology, wetting and intermolecular forces
- III. Solutions of polymers: Chain conformations and role of the solvent, Polymer at interfaces for colloidal stability
- IV. Flow properties of soft matter: Introduction to rheology - models and experimental methods, Rheology of diluted and concentrated suspensions and role of colloidal interactions

Learning outcomes

- To estimate the influence of the structure of soft materials on their properties and to modify surfaces to impart a desired functionality to them
- To obtain a theoretical understanding of the physics of soft condensed matter
- To design microscopic materials made from colloidal building blocks, stable emulsions and dispersions
- To obtain an insight of some experimental techniques that are relevant for investigating soft material physics.

Independent study

Objectifs : This activity is not concerned with framed autonomy activities outside personal work.

Méthodes : This activity is not concerned with framed autonomy activities outside personal work.

Core texts

- P.-G. de Gennes,, *SCALING CONCEPTS IN POLYMER PHYSICS*, Cornell University Press, 1979
P. Coussot, J.-L. Grossiord *COMPRENDRE LA RHÉOLOGIE*, EDP Sciences, 2002
P. Coussot, C. Ancey *RHÉOPHYSIQUE DES PÂTES ET DES SUSPENSIONS*, EDP Sciences, 1999

Assessment

Final mark = 2/3 Knowledge + 1/3 Know-how

Knowledge = 50% final exam + 50% continuous assessment