



Universidad  
del País Vasco

Euskal Herriko  
Unibertsitatea

KIMIKA  
FAKULTATEA  
FACULTAD  
DE QUÍMICA

## Máster en Química y Polímeros Surface and Colloids

**Course coordinator:** Dr. Nicholas Ballard ([nicholas.ballard@polymat.eu](mailto:nicholas.ballard@polymat.eu)) and Dr. Maria Paulis ([maria.paulis@ehu.eus](mailto:maria.paulis@ehu.eus))

**European ECTS credits:** 3

**Teaching language:** English

**Supporting files:** English

### **Description**

The main objective of this course is to provide the student current scientific knowledge in the fields of interfacial phenomena, including adhesion, colloidal properties of (including their rheology) and the film formation. Special attention is given to the colloidal, rheological and film formation properties of polymeric dispersions or latexes.

This will allow the student to get familiarized with the colloidal science behind the industrially widely used polymeric dispersions, that have applications in many sectors such as coatings, paints, adhesives, paper additives, carpet backings or in the more innovative drug release systems.

### **Outline**

#### *Theoretical*

1. Interfaces and capillarity

Interfacial and surface tension. Wetting phenomena. Capillarity. Contact angle. Methods to determine the surface tension.

2. Adhesion

Factors to take into account to get a good adhesion. Adhesion failures. Adhesive/substrate joint kinetics. Methods to evaluate adhesion.

3. Colloidal systems

Introduction to colloidal systems. Stability of colloidal systems. Surfactants.

4. Rheology of colloids

Introduction to the rheology of colloidal systems. Factors affecting the rheology of colloidal systems. Mathematical models. Rheological modifiers.

5. Film formation from polymeric dispersions

Introduction to film formation. Drying stage: water evaporation. Main mechanisms for particle deformation. Particles coalescence and interdiffusion.

#### *Practical*

Measurement of particle size, contact angle, CMC, film formation (MFFT, weight loss vs t, Horus equipment) and adhesive properties.

**Bibliography**

*Capillarity and Wetting Phenomena: Drops, Pearls, Bubbles and Waves*, P. de Gennes, F. Brochard-Wyart, D. Quéré, Springer, 2013.

*Colloids and Interfaces with Surfactants and Polymers*, J. Goodwin, Wiley, 2009.

*Surfaces, Interfaces and Colloids*, D. Myers, Wiley, 2002.

*Pressure sensitive adhesives and applications*, Istvan Benedek, Routledge, 2004.

*Adhesion Science: Principles and Practice*, Stephen Abbott, Destech Publications, 2015.

*Molecular Adhesion and its Applications – The Sticky Universe*, Kevin Kendall, Springer, 2001.

*Adhesion mechanisms at soft polymer interfaces*. Phil. Trans. R. Soc. A (2008) 366, 1425-1442.

*Fundamentals of Film Formation: Processes and Properties*, J.L. Keddie, A. F. Routh, Springer, 2010.