Faculty of Applied Sciences

MAPR2452   Physical statistic and macromolecular physics and chemistry

[30h+15h exercises] 4 credits

This course is taught in the 1st semester

Teacher(s):	Christian Bailly, Sophie Demoustier, Jacques Devaux, Pierre Godard, Alain Jonas, Roger Legras (coord.), Bernard Nysten
Language:	French
Level:	Second cycle

Aims

The objective of the course is to link phenomenological properties of polymers (thermodynamics) to statistical properties of chains at the microscopic level. It serves to explain the microscopic origin for macroscopic phenomena observed for polymers. This knowledge is used to detail the main techniques allowing to characterize polymer molecules in solution.

Main themes

Nil

Content and teaching methods

Statistical description of polymer chains (gaussian chain, real chains, Kuhn segment length, persistence length, excluded volume,...);
Chain elasticity;
Thermodynamics and statistical physics of polymer solutions: theories of Flory-Huggins and Flory-Krigbaum;
Application to polymer-solvent miscibility and phase separation;
Application to polymer characterization in solution (osmometry, viscometry, size-exclusion chromatography, light scattering) to determine absolute average molar mass, interaction parameters, gyration radius and molar mass distribution.

Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

Practical classes consist of a case study (a problem inspired from practical life). Students solve the problem by ordering experiments. A virtual budget is given to students to help them balance the cost effectiveness of each method.

Other credits in programs

CHIM22	Deuxième licence en sciences chimiques	
INCH23	Troisième année du programme conduisant au grade d'ingénieur civil chimiste	(4 credits)
MATR22	Deuxième année du programme conduisant au grade d'ingénieur civil en science des matériaux	(4 credits)