


 Faculty of Applied Sciences

MAPR2381 Macromolecular Chemistry

[45h+30h exercises] 6 credits

This course is taught in the 2nd 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 understand the chemistry mechanisms occurring in polymer synthesis and to determine their influence on the molecular characteristics, structures and properties of the polymers. Therefore, in the first part (15h + 15h exercises) of the course the main organic synthesis reactions are developed and their mechanisms are explained. In the second part (30h + 15h laboratory), the main macromolecular syntheses are described and some relationships between synthesis methods and various characteristics are put forward.

Main themes

Nil

Content and teaching methods

First part:

Covalent bonds, inductive effects and resonance, application to acid and base strength

Main organic reactions (nucleophilic aliphatic substitution and elimination reactions, alkenes addition reactions, nucleophilic addition and substitution to the carbonyl group, electrophilic and nucleophilic aromatic substitutions, oxidation and reduction reactions)

Second part

Polyaddition reactions

- free radical polymerization (mechanism, chain lengths and structure, transfer reactions, inhibition, mass, suspension and emulsion process)
- statistical copolymerization (mechanism, copolymer composition)
- diene polymerization and copolymerization (SBR, high impact polystyrene and ABS)
- ionic polymerization (mechanisms and characteristics)
- polymerization with organometallic catalysts (Ziegler-Natta, metallocene and Phillips) to polymerize ethylene and propylene with various molecular structures and molar mass distributions
- network polymers
- .Step polymerization
 - main characteristics
 - molar mass control
 - polycondensation mechanisms and examples
 - polymerization process
 - networks

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

No basic notions are required for this course

Other credits in programs

INCH21	Première année du programme conduisant au grade d'ingénieur (6 credits) civil chimiste	Mandatory
MATR21	Première année du programme conduisant au grade d'ingénieur (6 credits) civil en science des matériaux	Mandatory