

## Macromolecular Chemistry

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**European credits ECTS:** 6

**Teaching Language:** English

	Number of course slots (1h)	Number of course slots (1h)
<b>Magisterial</b>	40	
<b>Seminars</b>	5	
<b>Practical</b>		15

### Description

- Main synthesis methods of polymers: step-growth and chain-growth polymerization.
- Modification of already synthesized macromolecules, which derives in substantial properties and applications changes.
- Degradation processes of macromolecular materials due to oxygen, light, heat, mechanical stress and biodegradation.

### Outline

#### Part 1: Introduction

*Definitions and general concepts of macromolecules and their synthesis*

*Polymerizable structures and polymerization techniques.*

*Classification of polymerization reactions*

#### Part 2: Step-growth polymerization

*General aspects*

*Control of the molecular weight*

*Cyclation vs polymerization*

*Exchange reactions*

*Non linear polymers*

*Polymerization techniques*

*Open and close polymerization systems*

*Reactions producing applicable polymers*

#### Part 3: Chain-growth polymerization

*General aspects*

*Useful reactions for chain-growth polymerization*

*Living polymerization*

*Polymers structure*

*Ceiling temperature*

*Radical polymerization*

*Ionic polymerization of alkenes and cyclic monomers.*

*Stereospecific polymerization*

*Copolymerization*

## **Part 4: Polymer modification reactions**

*Characteristics*

*Reactions of the polymer backbone*

*Reactions of pending groups*

*Crosslinking of macromolecules*

*Graft and block copolymers*

## **Part 5: Polymer degradation**

*Definitions and general aspects.*

*Experimental techniques*

*Thermal and thermooxidative degradation*

*Photooxidative degradation*

*Mecanooxidative degradation*

*Biodegradation*

*Stabilization : antioxidants and photostabilizers*

## **Experimental practical contents**

Preparation and modification of Polymers using different polymerization reactions.  
Use of different techniques for the study of the degradation of polymeric materials.