

## Advanced Techniques of Polymer Characterization

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**European credits ECTS:** 5

**Teaching Language:** Spanish (English Friendly Course)

**Supporting files:** Spanish and English

	Number of course slots (1h)	Number of course slots (1h)
<b>Magisterial</b>	30	
<b>Seminars</b>	2	
<b>Practical</b>		18

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### Description

The course describes multiple experimental techniques, such as techniques for determination of the composition and microstructure of polymers, as well as techniques for characterization of thermal properties and morphological analysis. On the one hand, spectroscopic techniques such as infrared spectroscopy and nuclear magnetic resonance will be studied for microstructural characterization of the polymer. The thermal properties of the polymers will be analyzed by differential scanning calorimetry and thermogravimetry. The molecular weight characterization and the molecular weight distribution. The approach of the subject is clearly practical, although it is based in theoretical fundament.

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### Outline

#### **Part 1. Application of IR spectroscopy to polymer analysis.**

*Sample preparation techniques.*

*Use of infrared spectroscopy in the qualitative polymer analysis.*

*Use of FTIR in the quantitative polymer analysis.*

*Other applications.*

*Combined techniques (GC/FTIR, TGA/FTIR), Microscopy/FTIR,...*

#### **Part 2. NMR of Polymers**

*General aspects.*

*Analysis of the tacticity and microstructure of copolymers.*

*Statistical models.*

*Molecular weight calculation.*

## **Part 3. Characterization of molecular weight and its distribution.**

*Introduction.*

*Fundamentals and description of the GPC-SEC technique.*

*GPC-SEC with multidetectors.*

*Application of the GPC-SEC in the field of polymers.*

*Other techniques.*

## **Part 4. Use of thermal techniques: Thermal analysis (DSC), Thermal stability (TGA) and Optical microscopy (TOA).**

*Introduction, basics and experimental conditions.*

*The amorphous polymer state: glass transition temperature.*

*Polymer melting and crystallization.*

*Heat and reaction kinetics.*

*Fundamentals and Description of thermogravimetry.*

*Thermogravimetry applications on polymers.*

*TOA application in polymer crystallization*