



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## SYLLABUS DEL CORSO

### Sintesi Avanzate di Polimeri

2122-2-F5401Q074

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#### Aims

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The students will master the state-of-the-art in chain growth polymerisation methods, the links between controlled and living polymerization methods and the molecular characteristics of the resulting polymer chains (molar mass, chain dispersity, architecture). Furthermore, the students will gain a significant knowledge about the impact of the innovative polymerization methods on the industrial processes as well as the sustainability of the most promising natural/biobased polymers.

#### Contents

Studies synthesis of polymeric materials, emphasizing interrelationships of chemical pathways, process conditions, and microarchitecture of molecules produced. Living and quasi living techniques are discussed, including reversible addition a fragmentation transfer polymerizations (RAFT) and atom transfer free radical polymerizations (ARTP), catalytic approaches to well-defined architectures, and polymer functionalization in bulk and at surfaces. Process conditions include bulk, solution, emulsion, suspension, gas phase. Microarchitecture includes tacticity, molecular-weight distribution, sequence distributions in copolymers.

#### Detailed program

Modern Methods for Polymer Synthesis

- 1 Introduction: Living and controlled chain polymerizations
2. Atom-transfer radical polymerizations (ATRP)
3. Nitroxide-mediated radical polymerizations (NMP)
4. Reversible addition-fragmentation chain-transfer polymerizations (RAFT)
5. Polymerization Induced Self Assembly (PISA)
6. Anionic polymerizations
7. Living ring-opening polymerizations (LROP).
8. Organocatalytic ring-opening polymerizations
9. Ring Open Metathesis Polymerization (ROMP)
10. Polymer synthesis exploiting click reactions

#### Reactive Modification of Polymers and Blending

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2. Polymer Rheology
  3. Polymer and copolymer blending
  4. Additives in polymers: synthesis and interactions of additives with polymer chains (plasticizers, dyes ect.)
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2. Synthetic approaches, properties and application of biobased and biodegradable polymers (polylactid acid, polyglycolic, polyhydroxyalcanoates)

### **Prerequisites**

Basic knowledge of polymer chemistry

### **Teaching form**

Lectures in classroom

## **Textbook and teaching resource**

Scientific publications relating to the specific topics of the course will be provided

Powerpoint presentation containing the lessons

## **Semester**

First semester

## **Assessment method**

The exam consists of an oral exam in which the topics presented in the lessons are discussed. In addition to learning the fundamentals presented in the course, the student's skills and aptitudes are also assessed to adapt the theoretical foundations of polymer synthesis to particular operational and practical conditions; the exhibition capacity and adequacy of the student's language is evaluated.

## **Office hours**

On tuesday from 2:00 to 4:00 in instructor's office

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