



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## COURSE SYLLABUS

### Supramolecular Chemistry

2425-1-F5401Q063

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#### Aims

##### D1 - KNOWLEDGE AND UNDERSTANDING ABILITY

At the end of this training activity, the student must demonstrate to be able to read a scientific article dealing with the synthesis and characterization of supramolecular systems (host-guest chemistry, sensors, self-assembling and biomimetic systems, molecular machines). To achieve this goal during the course a series of very recent articles are analyzed that explain and exemplify the topics covered. The course provides the student with specific knowledge in the following areas:

- 1 Spectroscopic methods (NMR, UV, IR, microcalorimetry, Surface Plasmon Resonance, Mass) for the determination of molecular interactions
- 2 Synthesis methods of the main host systems (cavitands, spherands, macrocycles)
- 3 Main applications of host-guest chemistry

##### D2 - CAPACITY TO APPLY KNOWLEDGE AND UNDERSTANDING

At the end of this training activity, the student must demonstrate that he is able to:

- 1 Draw a host molecule given a guest
- 2 Imagine host-guest systems in different application areas
- 3 Imagine the best analytical technique for studying a host-guest system

##### D3 - JUDGMENT AUTONOMY

At the end of this training activity, the student must demonstrate to be able to critically read a scientific article,

analyze its contents, judge any weaknesses and strengths of the article, foresee possible experimental and application limitations, imagine creatively further developments of the technique presented by the article. The teacher stimulates the critical discussion of the articles presented in class in order to accustom the student to this type of analysis of scientific literature.

Some students will present insights on specific topics that are then discussed together in the classroom.

#### D4 - LEARNING SKILLS

Expected results:

- 1 Collect and understand the new information needed to rationalize the properties of new host-guest systems published in the scientific literature
- 2 Collect and understand information about the evolution of supramolecular systems and their properties

### **Contents**

Basic concepts in supramolecular chemistry. methods for binding studies. Analysis and study of recent scientific papers on: host/guest chemistry, sensors, molecular devices, auto-assembling systems, biomimetic systems

### **Detailed program**

- 1) introduction to supramolecular chemistry and host/guest chemistry
- 2) molecular interactions, hydrogen bond, supramolecular polymers
- 3) Analytical methods to study molecular interactions: NMR. mass, fluorescence. ITC, SPR, others...
- 4) host structures: crown ethers, cryptands, spherands, lariat ethers, calixarenes, cucurbiturils, cyclodextrins
- 5) Rotaxanes of Stoddart, the molecular muscles of Sauvage, the molecular rotors of Feringa
6. molecular ratchets: the unidirectional movement
- 7) works of students

### **Prerequisites**

The course is intended for students who have a solid background in chemistry, with an advanced knowledge of organic chemistry. A good knowledge of the analytical methods in organic chemistry is also needed, in particular NMR spectroscopy.

## **Teaching form**

13 two-hour lectures, in person, Delivered Didactics  
3 seminars of 2 hours in person, hybrid didactics

## **Textbook and teaching resource**

slides (on Moodle)

articles of scientific journals (on Moodle)

textbooks

## **Semester**

second semester

## **Assessment method**

Oral examinations in presence.

## **Office hours**

by email appointment

## **Sustainable Development Goals**

GOOD HEALTH AND WELL-BEING | AFFORDABLE AND CLEAN ENERGY | INDUSTRY, INNOVATION AND INFRASTRUCTURE

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