UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Supramolecular Chemistry

2627-1-F5402Q008

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 - Making judgements

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-COMMUNICATION SKILLS

Some students may present in-depth studies of specific topics that are then discussed together in class. Class presentations are an important moment in learning the ability to communicate scientific data through a presentation.

D5 - 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 undirectional movement

7) works of students

Prerequisites

To follow and appreciate this course, a basic knowledge of organic chemistry is required. A basic knowledge of

analytical methods in organic chemistry, in particular NMR, UV and fluorescence spectroscopy, would be preferable. In any case, all these topics are covered in the course.

Teaching form

4 CFU (32 hours) of lessons:
12 lessons of 2 hours in person, Delivered Didactics on the main topics of the course
4 lessons 2 hours in person of Interactive Teaching, students present and discuss some specific topics from litteraturre

Textbook and teaching resource

slides (on Moodle)

articles of scientific journals (on Moodle)

textbooks

Semester

second semester

Assessment method

Oral exam only based on an interview on the topics covered in class and on in-depth analysis of scientific literature. Some students decide to delve deeper into a topic in the form of a **short essay** by making a presentation during the lectures (a block of 2-3 lectures at the end of the course is dedicated to in-class presentations).
Grade ranges:
18-19: preparation on a small number of topics in the course program, many gaps and limited critical processing ability;
20-23: preparation on a part of the topics in the course program, independent analysis ability only on purely practical and executive issues, use of inaccurate vocabulary and rather uncertain expository ability;
24-27: preparation on a large number of topics covered in the course program, ability to independently carry out argumentation and critical analysis, ability to apply knowledge to contexts and connect themes to concrete cases, use of correct vocabulary and competence in the use of disciplinary language;
28 – 30/30L: complete and exhaustive preparation on the topics in the exam program, personal ability to deal autonomously and critically analyze the topics, ability to reflect and self-reflect and to connect the topics to concrete cases and different contexts, excellent ability to think critically and autonomously, full mastery of the disciplinary vocabulary and a rigorous and articulated expository ability, ability to argue, reflect and self-reflect, ability to connect to other disciplines

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Office hours

by email appointment

Sustainable Development Goals

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