UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Chemistry and Technology of Polymers and Industrial Applications

2122-1-F5302Q009

Aims

The aim of the course is to highlight the preparation and transformation processes of a few classes of polymers for applications with particular attention to functional polymers, and both up-to-date scientific methods and technological processes to improve their chemical, physical and mechanical properties.

Contents

The course encompasses advanced technological processes in the synthesis and transformation of polymers, including new methods of polymer synthesis, introduction to hybrid materials with particular emphasis to preparation and characterizion of polymer materials endowed with heterogeneous interfaces and new functional properties.

Detailed program

Polymers for applications such as thermoplastic polymers, termosetting polymers and termoplastic elastomers.

Advanced technological processes with the final aim to improve the functional properties of polymers.

New methods for the preparation of three-dimensional polymers.

Polymer preparation in the solid state and in the confined state (micelles, liposomes).

Self-assembly of polymeric chains.

Self-healing polymers.

Application of hybrid materials, such as modified clays, to polymers for improving mechanical and optical properties. Particular attention will be paid to composites, elastomers for the automotive industry and polymers for electronic applications.

Characterization of the extended interfaces by advanced methods.

Additives for better microadhesion at the heterogeneous interfaces.

Star polymers and dendrimers as additives.

Spheripol process for polymer growth with morphology retention.

Liquid-crystal polymers with high performances.

Advanced polymeric materials for optical and structural applications.

Polymers for biomedical applications.

The course includes seminars by experts in the field of polymer chemistry and will be integrated by visits to polymer companies of the area.

The student is requested to propose a subject of his/her interest in the field to be presented to the class.

Prerequisites

- Basic knowledge of macromolecular chemistry.

Teaching form

Lectures , seminars on specific topics, seminar of experts in the field and visits to industrial research laboratories.

In the COVID-19 emergency period, the lessons will be delivered in a mixed-mode: lessons recorded in live streaming and deferred. Other methods may be proposed in accordance with the University ordinances.

Textbook and teaching resource

1) Introduction to Physical Polymer Science, L. H. Sperling. Wiley-Interscience (2006).

2) Polymer Chemistry. S. Koltzenburg, M. Maskos, O. Nuyken. Springer (2017).

3) Hybrid Materials: Synthesis, Characterization, and Applications. Editor: G. Kickelbick. Wiley-VCH (2007). ISBN: 978-3-527-31299-3

4) Lecture Notes.

Semester

1st year, 2nd semester.

Assessment method

Oral Exam:

Evaluation of the acquired knowledge during the course and presentation of a chosen topic in the field of materials chemistry and technology.

In the Covid-19 emergency period, oral exams will be telematic. They will be carried out using the WebEx platform and on the e-learning page of the course there will be a public link for access to the examination of possible virtual spectators.

Office hours

By appointment.

During the COVID-19 emergency period, the students are invited to send an email to the teacher (angiolina.comotti@unimib.it) for an appointment. They will be contacted for a videocall.