UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Engineering, Characterization and Degradation of Polymers in The Marine Environment

2425-1-F7502Q046

Aims

The course aims to define what polymers (including plastics and bioplastics) are in terms of physicochemical structure, their properties, their synthesis, and their production. Another goal of the course is to learn the current techniques for fabricating different types of materials based on polymers, and how to characterize them. Lastly, the concept of biodegradation, sustainable and green materials, the use of new biopolymers, and the impact and fate of these polymeric materials in the marine environment will be explained.

Contents

Introduction to Materials and Polymer Science. Definition, types, and physicochemical features of Polymers. Characterization of materials based on Polymeric structure. Design and fabrication of advanced polymeric materials. Degradation and Biodegradation in the marine environment of polymeric structure and their impact on the marine ecosystem.

Detailed program

Definition of polymer. Types and synthesis of polymers and their main features. Polymeric materials based on natural and synthetic polymers. Engineering advanced and active polymeric materials. Characterization of polymeric materials such as morphological, thermal, and mechanical properties, interaction with water, and others. Fabrication of polymeric materials such as solvent casting, spin coating, rod coating, electrospinning, extrusion, injection molding, blow molding, freeze drying, salt leaching, and others. Engineered living materials. Applications field of polymeric materials. Definition of biodegradable, compostable, eco-friendly, green, and sustainable

polymeric materials. Plastics, bioplastics, and micro-/nano-plastics. Biodegradation and impact in the marine environment.

Prerequisites

No specific requisites are required.

Teaching form

21 two-hour lectures, online via webex, Interactive Teaching.

Textbook and teaching resource

Sustainable Food Packaging Technology; Edited by Athanassia Athanassiou. Wiley,
Polymer Science and Innovative Applications; Edited by Mariam Al Ali Almaadeed, Deepalkeshmi Ponnamma, Marcelo A. Carignano. Elsevier 2020.
Scientific Papers

Semester

Second semester, first year.

Assessment method

Oral exam.
ORAL EXAMINATION ON THE TOPICS DEVELOPED DURING THE COURSE.
During the exam the student will be asked to examine an object composed of polymeric material and put into practice the notions acquired during the course, from defining the composition, the methods of production of that object, any techniques with which characterize it, and its fate if the object ends up in the environment.

Office hours

By appointment (upon request by e-mail).

Sustainable Development Goals

CLEAN WATER AND SANITATION | RESPONSIBLE CONSUMPTION AND PRODUCTION | LIFE BELOW WATER