UCLouvain

lchm2261a

2021

Polymer Chemistry and Physical Chemistry (part 1 : Polymer Chemistry)

3.00 credits	22.5 h + 7.5 h	Q1

Teacher(s)	Fustin Charles-André ;Gohy Jean-François ;
Language :	English
Place of the course	Louvain-la-Neuve
Prerequisites	This course requires a previous basic knowledge of the physics and chemistry of polymers, as given in the introductory courses LCHM1361 or LMAPR2019, e.g.
Main themes	This course provides an introduction to advanced methods of polymerisation. The course is made of projects. All topics are not necessarily covered each year. After recalling the basics of chain polymerization methods, the different current synthetic strategies will be studied (anionic, cationic, standard radical, controlled radical and coordinative polymerization methods). The scope and limitations of each method will be systematically discussed. Mechanistic and kinetic features will be then studied for each polymerization method. Special emphasis will be finally placed on the control of macromolecular architectures.
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 The course aims at providing a deep knowledge of chain growth polymerisation methods. At the end of the course, the students will master the state-of-the-art in chain growth polymerisation methods, the links between controlled and living polymerisation methods and the molecular characteristics of the resulting chains (molar mass, chain dispersity, architecture), and the technological gridlocks facing chain growth polymerisation. Additionally, the students will be able to use the above-mentioned concepts in order to propose relevant synthetic methods for specific cases. The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled 'Programmes/courses offering this Teaching Unit'.
Evaluation methods	50% of the final mark is attributed to the work performed during the year (continuous evaluation) and 50% for the written exam. The written exam consists of solving cases similar to those studied during the course.
Teaching methods	**Part A "Chain polymerization methods"** The chemistry part is based on a ***self-learning system*** . Scientific reviews, dealing with the main polymerization methods, will be provided and will be analyzed in small groups. Each student will work on three projects (polymerization methods). The self-learning will be conducted for two to three weeks during which the students and teachers will meet to discuss the reviews and prepare a presentation summarizing the reviews (see schedule). The students will then present orally their project before the whole class, followed by questions. This self-learning process will be evaluated by the teachers. **Part B "Physical chemistry of polymers in solution"** The physical chemistry part is made of a small number of classes in ***flipped classroom format***, in which the students resolve small problems and discuss concepts with the teacher, based on a prior reading of a section of the lecture notes and/or on watching podcasts. Before each class, the students have to answer a few questions on their preparative reading (quizzes); their answers are used by the teacher to identify misconceptions and tune the content of the classes. A small interrogation at the end of each class contributes to the continuous evaluation of the students.
Content	1. Introduction: Living and controlled chain polymerizations 2. Atom-transfer radical polymerizations (ATRP) 3. Nitroxide-madiated radical polymerizations (NMP) 4. Reversible addition-fragmentation chain-transfer polymerization (RAFT) 5. Anionic polymerizations 6. Living ring-opening polymerizations (LROP) 7. Organocatalytic ring-opening polymerizations 8. Control of macromolecular architectures 9. Mechanistic transformations 10. Supramolecular polymerizations

Inline resources	The scientific papers that are the base for the course are available on Moodle
Bibliography	L'ouvrage de référence suivant couvre *une partie* des concepts du partim B / the following textbook deals with *part* of the concepts of part B: Paul C. Hiemenz & Timothy P. Lodge, Polymer Chemistry, 2nd edition, CRC Press:Boca Raton, 2007. Cet ouvrage n'est pas indispensable pour la participation au cours. This book is not required for the course.
Other infos	Written notes and reference books will be made available for the students. The course could be partly or totally delivered by an invited lecturer.
Faculty or entity in charge	CHIM

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Chemistry	CHIM2M	3		🔍
Master [120] in Chemistry and Bioindustries	BIRC2M	3		🔍