29941 - Polymerization Reactions

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	435 - Bachelor's Degree in Chemical Engineering
ECTS	6.0
Course	4
Period	Second semester
Subject Type	Optional
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

The learning process that has been designed for this subject is based on the following:

The learning process will take place at several levels: masterclasses, problem solving (case studies) and practical work, deliverables and oral presentations. They will require a progressive increase in student participation. Masterclasses will provide the theoretical basis that makes up the subject as well as solutions for key exercises. Practical cases, problem-solving sessions and practical work constitute an effective complement to masterclasses. The combination of both practical and theoretical sessions will provide the student a more applied and critical point of view. The deliverables (essays) will constitute the most important part of the evaluation in which the student will establish the basis of their

academic success.

5.2.Learning activities

Masterclasses and problem-solving sessions (30 h). Materclasses will provide the theoretical basis of the different proposed subjects and key problem examples will be resolved. During the **practical cases attendance** - based sessions (10 h) the students will solve problems supervised by the lecturers. Problems and/or case studies will be related to the theoretical aspects explained during the masterclasses.

Laboratory practices (20 h): 5 sessions of 4 hours each, which will be directly related to the subjects explained during the masterclasses and problem-solving sessions.

Supervised essays (22 h). Student will have to submit a written essay and an oral presentation. Work will be carried out throughout the semester and it will be supervised and evaluated by the lecturer.

Self-study (65 h). We strongly recommend the students to carry out individual study in a continuous manner during the semester.

Final evaluation (3 h). Students will perform a final examination with supporting material (books and notes). The students will show, individually, the acquired theoretical and practical skills, as well as their ability to develop critical thinking in specific questions related to the different subjects.

5.3.Program

Sessions calendar and essays submission

Masterclasses and problem-solving sessions will be held according to the EINA schedule.

Each teacher will inform about the tutorial session schedules. The module's program is the following:

The masterclasses, problems solving and practical cases

Chapter 1. General introduction (1 h).

Chapter 2 . Polymerization process (16 h)

Chapter 3. Products obtained by different polymerization process (3 h)

Chapter 4. Reactor configuration (3 h).

Chapter 5. Polymers properties (5 h).

Chapter 6 . Compound formulation (2 h).

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Chapter 7 . Problems (10 h).

Laboratory

- **Practice 1** . Conventional *Vs* controlled radical polymerization. TEMPO (persistent radical) mediated polymerization of styrene (4 h).
- **Practice 2** . Synthesis of graft copolymers of unsaturated polyester and styrene **.** Preparation of laminated composites of unsaturated polyester reinforced with biodegradable cellulosic fibers (4 h).
- **Practice 3** . Preparation of thermoset polyurethanes and elastomeric polyurethanes. Flexible and rigid polyurethane foams (4h).
- **Practice 4** . Chemical modification of cellulose. Acetylation and deacetylation of cellulosic fibers. Characterization of cellulose acetates and preparation of polymeric membranes and oil sorbent materials (4 h).
- **Practice 5** . Water soluble polymers of industrial relevance. Preparation of polyvinyl alcohol, alginate and chitosan based hydrogels (4 h).

5.4.Planning and scheduling

Sessions and oral presentations schedule

Master classes and problem-solving sessions are held according to the EINA schedule.

Each teacher will inform the student about the tutorial session schedules.

5.5.Bibliography and recomended resources

BB	Gnauck, Bernhard. Iniciación a la química de los plásticos / Bernhard Gnauck, Peter Fründt . - 1a. ed. española Barcelona : Hanser, D.L. 1992
BB	Odian, George. Principles of polymerization / George Odian . - 4th ed. Hoboken, N.J. : Wiley-Interscience, cop. 2004
BB	Polímeros / Javier Areizaga...[et. al.] Madrid : Síntesis , D.L. 2002
BB	Polymer reaction engineering / edited by José M. Asua Oxford : Blackwell, cop. 2007
BB	Polymer synthesis : theory and practice : fundamentals, methods, experiments / D. Braun ... [et al.] . 5th ed. Heidelberg [etc.] : Springer, cop. 2013
BB	Polymerization process modeling / Neil A. Dotson...[et al.] New York [etc.] : wiley-VCH, cop. 1996
BB	Ramos Carpio, Miguel Ángel. Ingeniería de los materiales plásticos / M. A. Ramos Carpio, M. R. de María Ruíz Madrid : Díaz de Santos, D.L. 1988
BB	Reyne, Maurice. Technologie des plastiques / Maurice Reyne . 3e éd. rev. et

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BB	augm. Paris : Hermes, cop. 1998 Seymour, Raymond B.. Introducción a la química de los polímeros / Raimond B. Seymour, Charles E. Carraher, jr. ; versión española e la 3a ed. en inglés] por Rogelio Areal Guerra . - [1a ed.] Barcelona [etc] : Reverté, D.L.1995