

COURSE SYLLABUS

1. Identification

Code and title: QUP 006 – Theoretical Polymer Chemistry
Professor: Cesar Liberato Petzhold and Raquel Santos Mauler
Level: Master and Doctorate
Credit hours: 3
Revised: August_2019

2. Summary

Chain and step polymerization: main characteristics; mechanism; kinetics; limitations and applications. Polymer modification.

3. Objective

Study of the polymer chemistry covering the main polymer synthesis techniques and modification, giving emphasis on the recent advances in each one.

4. Contents

- Introduction: definition, nomenclature, molecular weight, morphologie and main properties.
- Step polymerization: mechanism, kinetics and condensation polymers. Enzymatic polymerization.
- Radical polymerization: initiators, mechanism, kinetics. Reversible deactivation radical polymerization (NMP, ATRP and RAFT, ..)
- Ionic polymerization (anionic and cationic): initiators, mechanism, kinetics.
- Ring opening polymerization: initiators, mechanism, kinetics.
- Copolymerization: copolymer composition (reactivity ratio), ionic and radical copolymerization.
- Polymerization techniques: emulsion, suspension, bulk, solution.
- Stereoregular polymerization: Ziegler Natta and metallocene catalyst, mechanism and kinetics.
- Polymer reactions: polymer reactivity and main polymer modifications. Grafting.

5. Assessment

Test and/or seminar (depending on the number of students enrolled). The student, who obtains a final grade of A, B or C, awarded as per the list below, will be considered approved:

- A: grade equal to or above 9.0
- B: grade equal to or above 7.5 and below 9.0
- C: grade equal to or above 5.0 and below 7.5
- D: grade below 5
- FF: lack of frequency

6. Methodology

Lectures, exercises lists, seminars and examinations.

7. Bibliography



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- Handbook of Radical Polymerization, Matyjaszewski, K., Davis, T. P., John Wiley & Sons, Inc., 2002.
- G. Odian, Principles of Polymerization, 4^a ed., John Wiley & Sons, NY, 2004.
- H. F. Mark et al. (ed), Encyclopedia of Polymer Science and Engineering, John Wiley & Sons, NY, 1985.
- M. P. Stevens, Polymer Chemistry – An Introduction 3^a ed., Oxford University Press, NY, 1999.
- J. M. G. Cowie, Polymers: Chemistry and Physics of Modern Materials, 3rd Ed. Textbook Co. Ltd, 2007.
- C. E. Carraher Jr., Introduction to Polymer Chemistry, 4a Ed, Taylor & Francis Group, 2017.
- Recent published papers on the field.