Name: ***Technology and properties of new polymers (C-PS.II1-TechPoly)***
Name in Polish:
Name in English: ***Technology and properties of new polymers***

Information on course:

Course offered by department: Faculty of Chemistry
Course for department: Faculty of Chemistry

Default type of course examination report:

Grading

Language:

English

Course homepage:

http://www.polimery.umcs.pl

Description:

LECTURE
1. The Nature of Polymeric Materials.What are polymer-what is polymer science.Some basic definition.Elements of polymer macrostructure. Molecular weight. Chemical structures of some common polymers.
2. Polymer synthesis.Step-growth polymerization. Chain or addition polymerization. Polymerization processes.
3. Kinetics of step-growth polymerization.
4. Statistic of step growth polymerization. Molecular weight distributions in condensation polymers. Multichin condensation polymers. Theory of gelation. random branching without network formation.
5. Copolymerization.The copolymer equation. Reactivity ratios and copolymer composition. Copolymer sequence distribution and the application of propability theory.
6. Structure.states of mater and bonding in polymer materials. The conformation of polymer chains. Random walks, random flights and disordered polymer chain. Polymer morphology.
7. Crystalization, Melting and the Glass transition.
8. Thermodynamics of polymer Solutions and blends.The free energy of mixing. The phase behaviour of polymer solutions and blends. Dilute solutions, excluded volume and the theta temperature.
9. Molecular weight and branching. Osmothic pressureand the determination of number average molecular weight. Light scattering and determination of weight average molecular weight. size exclusion chromatography(SEC). Sec and the determination of long chain branching.
10. Mechanical and Rheological Properties. Fundamentals. Deviation from ideal behaviour. Introduction to viscoelasticity. Non-linear mechanical and rheological behaviour.
11. Macromolecular architectures.
12. Microspheres, Microcapsules and Liposomes. General concept.Manufacturing methodology. Properties and applications
13. Porous polymers and adsorbents.
14. Imprinted polymers.
15. Hydrogels. Preparation. Swelling and deswelling. Dispersion stabiliy. Solute Permentation.
16. Biodegradable Polymers.Polymeric materials from Renewable Resources. Natural blends and composites.Biodegradable Composites
17. Industrial applications. Raw material selection. Processing and forming. Automotive. Medicine. Pharmacy. Agriculture
18. Recycling of polymers.

LABORATORY
1. Synthesis of highly crosslinked porous polymeric microspheres.
2. Characterization of internal strucure and thermal resistance of synthesized porous crosslinked microspheres.
3. Synthesis and characterization of hydrogels with the use of chitosan
4. Synthesis and characterization of biosorbents.
5. Synthesis of poly(ethylene adipate) by condensation polymerization.

Bibliography:

1. P. Painter "Fundamental of Polymer Science"
2. J. Brandrup, E.H. Immergut, E. A. Grulke "Polymer Handbook"
3. l. Yu (ed) "Biodegradable Polymer Blend and Composites from Renewable Resources"
4. K. Matyjaszewski, M. Moller (Eds.) Polymer Science: A Comprehensive Reference

Learning outcomes:

KNOWLEDGE
W1. Student characterize different types of polymers.
W2. Student discerns structure-property relationship with reference to various types of polymers.
W3. Student defines the basic physico-chemical parameters of polymers.
SKILLS

U1. Student is able to analyze and interpret information from different sources.
U2. Student is capable to use acquired knowledge for planning and preparing polymer synthesis.
U3. Student is able to properly interpret the results of experiments.
ATTITUDES
K1. Student is open to different scientific resources and understand the need of further education.
K2. Student is able to work in team and inspire in others the learning process
K3. Student is aware of the risks and have the knowledge on how to properly handle chemical substances.

missing attribute description in English

Contact hours (work with an academic teacher)
Lectures – 30 hours
Laboratory – 30 hours
Total number of hours with an academic teacher 60 hours
Number of ECTS points with an academic teacher 2 points
Non-contact hours (students' own work) 60
Total number of non-contact hours 60
Number of ECTS points for non-contact hours 2 points
Total number of ECTS points for the module- 4 points

Consultations - 2 hours

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KNOWLEDGE
W1. - lecture - exam; laboratory - continuous assessment
W2. - lecture - exam; laboratory - continuous assessment
W3. - lecture - exam; laboratory - continuous assessment
SKILLS
U1. - lecture - exam
U2. - laboratory - continuous assessment
U3. - laboratory - continuous assessment
ATTITUDES
K1. - lecture - exam; laboratory - continuous assessment
K2. - laboratory - continuous assessment
K3. - laboratory - continuous assessment

Requirements

Basic knowledge of organic chemistry

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	4	15/16	