



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Polimerna kemija
Course title:	Polymer chemistry

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester
Enovit magistrski študijski program druge stopnje Predmetni učitelj	/	4.	Zimski
Five-year master's degree program Subject Teacher	/		Autumn

Vrsta predmeta / Course type

Obvezni / Obligatory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Terenske vaje Field work	Samost. delo Individ. work	ECTS
30			30		30	3

Nosilec predmeta / Lecturer:

Peter KRAJNC

Jeziki / Predavanja / Lectures:

slovenski / slovene

Languages:

Vaje / Tutorial:

slovenski / slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Znanje splošne kemije. Znanje organske kemije.

Prerequisites:

Knowledge of general and organic chemistry.

Vsebina:

Uvod: razdelitev polimerov po kemijski sestavi in načinu priprave, nomenklatura polimerov.

Načini polimerizacije (kemizem): radikalska (prosta in kontrolirana), kondenzacija.

Načini polimerizacije (medij): v topilu, v masi, heterogeni mediji.

Vplivi polimerizacijskih pogojev na strukturo.

Strukturna organiziranost polimerov, strukturni nivoji: molekulska, nadmolekulska in mikrostruktura polimerov.

Naravni polimeri: pridobivanje in uporaba.

Sintetični polimeri: sodobni polimerni materiali.

Analizne metode za identifikacijo kemizma in strukturne organiziranosti polimerov.

Vaje iz predmeta vključujejo radikalsko polimerizacijo (v masi in s heterogenim medijem), kondenzacijo (poliamidi, poliuretani).

Content (Syllabus outline):

Introduction: systematics and nomenclature of polymers.

Polymerisations (chemistry): radical (free and controlled), condensation.

Polymerisations (medium): solvent, bulk, heterogenous.

Influence of polymerisation conditions on the structure.

Structural levels of polymers: molecular, supramolecular, micro.

Natural polymers: preparation and applications.

Synthetic polymers: advanced polymeric materials.

Analytical methods for identification of chemistry and structure of polymers.

Experimental course includes radical polymerisation (bulk, heterogenous media), condensation (polyamides, polyurethanes).

Temeljni literatura in viri / Readings:

1. D. Braun, H. Cherdrón, H. Ritter: Polymer Synthesis: Theory and Practice, Springer, Berlin, 2001.
2. B. J. Hunt, M. I. James (Eds.): Polymer Characterisation, Chapman and Hall, Glasgow, 1993
3. H. G. Elias: Macromolecules (Vol.1 in 2), Wiley, London, 1977.

Cilji in kompetence:

Spoznati osnovne načine priprave sintetičnih polimerov.

Poznati lastnosti naravnih in sintetičnih polimerov in njihova področja uporabe.

Obvladati mehanizme kemizma sinteze polimerov

Objectives and competences:

To know:

basic ways of polymer preparation,

characteristics of natural and synthetic polymers and their fields of preparation,

principles of structure relations,

analytical methods for polymer characterisations.

Spoznavanje principov oblikovanja strukture polimernih materialov ter sprememb strukture zaradi modifikacije polimerov.

Poznati analitske metode, ki se uporabljajo za karakterizacijo polimerov.

To understand the mechanisms of polymer synthesis.

Predvideni študijski rezultati:

Znanje in razumevanje:

Študent pozna sintezne načine polimerov.

Razume mehanizme kemijskih reakcij priprave.

Pozna analitske metode za karakterizacijo kemizma in strukture polimerov.

Prenesljive/ključne spretnosti in drugi atributi:

Intended learning outcomes:

Knowledge and understanding:

Student knows synthetic pathways for various polymers.

Understands the mechanisms of synthetic reactions.

Knows the analytical methods for the characterisations of chemistry and structure of polymers.

Transferable/Key Skills and other attributes:

Metode poučevanja in učenja:

Predavanja, seminarsko delo, laboratorijske vaje.

Learning and teaching methods:

Lectures, seminar work, laboratory experiments.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Pisni izpit (ali kolokviji)

80

Written exam (or partial exams)

Laboratorijske vaje

20

Lab work

Reference nosilca / Lecturer's references:

1. KOVAČIČ, Sebastijan, JEŘÁBEK, Karel, KRAJNC, Peter, SLUGOVC, Christian. Ring opening metathesis polymerisation of emulsion templated dicyclopentadiene giving open porous materials with excellent mechanical properties. *Polymer chemistry*. [Print ed.], Feb. 2012, vol. 3, iss. 2, str. 325-328, doi: 10.1039/c2py00518b.
2. KOVAČIČ, Sebastijan, FERK, Gregor, DROFENIK, Mihael, KRAJNC, Peter. Nanocomposite polyHIPEs with magnetic nanoparticles : preparation and heating effect. *React. funct. polym.* [Print ed.], Available online 11 May 2012, doi: 10.1016/j.reactfunctpolym.2012.05.001.
3. PULKO, Irena, KRAJNC, Peter. High internal phase emulsion templating - a path to hierarchically porous functional polymers. *Macromol. rapid commun.*, 2012, vol. 33, issue 20, str. 1731-1746, doi: [10.1002/marc.201200393](https://doi.org/10.1002/marc.201200393).
4. PULKO, Irena, SANDHOLZER, Martina, KOLAR, Mitja, SLUGOVC, Christian, KRAJNC, Peter. Removal of an olefin metathesis catalyst using 4-nitrophenyl acrylate based polymer supports. *Tetrahedron lett.* [Print ed.], 2010, vol. 51, issue 44, str. 5827-5829, doi: 10.1016/j.tetlet.2010.08.114.
5. PULKO, Irena, WALL, Jennifer, KRAJNC, Peter, CAMERON, Neil R. Ultra-high surface area functional porous polymers by emulsion templating and hypercrosslinking : efficient nucleophilic catalyst supports. *Chemistry (Weinh., Print)*. [Print ed.], Feb. 2010, vol. 16, iss. 8, str. 2350-2354, doi: 10.1002/chem.200903043.

Projekti/Projects:

L2—2008 Makroporozne polimerne membrane za separacijo biomakromolekul

L2—2283 Vpliv sestave polimerizacijske mešanice na latnosti poroznih monolitov

J2—1176 Separacija in formulacija biološko aktivnih snovi izoliranih iz rastlinskih materialov