

## PHD STUDIES COURSE UNIT DESCRIPTION

Name of subject	Field of science, code	Faculty / Center	Department
Reactions of high molecular weight compounds	Chemistry N 003	Faculty of Chemistry and Geosciences	Department of Polymer Chemistry
Student's workload	Credits	Student's workload	Credits
Lectures		Consultations	2
Independent study	8	Seminars	

### Course annotation

The chemical reactions of macromolecules and their role in the synthesis of new polymeric materials. Reactivity properties of macromolecules. Configurational, conformational, concentration, electrostatic and supermolecular effects. Influence of neighboring groups on chemical changes in macromolecules. Polymer-analogous reactions of carbon-chain and heterochain polymers. Incorporation of new functional groups. Cyclization reactions.

Synthesis of block copolymers. Reactions between terminal groups of macromolecules. "Living" radical and ionic polymerization. Synthesis of graft copolymers. Macromonomers, macroinitiators and graft copolymers derived therefrom.

Crosslinking reactions. Photochemical and radiation crosslinking. Crosslinking through labile functional groups. Ionic crosslinking. Vulcanization. Curing of thermosetting resins.

Modification of cellulose and other natural polymers. Synthesis of cellulose ethers and esters. Synthesis of grafted polymers based on natural compounds.

Interpolymer complexes, their formation, stoichiometry and stability.

Destruction of polymers: chemical (hydrolysis, alcoholysis, aminolysis), oxidative and ongoing under the influence of physical factors (heat, light, ionizing rays, mechanical force). Depolymerization.

### Reading list

1. S. Koltzenburg, M. Maskos, O. Nuyken. Polymer chemistry. Berlin: Springer, 2017.
2. G. Odian. Principles of Polymerization. 4th ed. John Wiley & Sons, Inc., 2004.
3. M. P. Stevens. Polymer Chemistry. 3 ed. Oxford University Press, 1999.
4. R. Wool, X. S. Sun. Bio-Based Polymers and Composites. Academic Press, 2005.
5. A. Žemaitaitis. Polimerų fizika ir chemija. Kaunas: Technologija, 2001.
6. J. Koetz, S. Kosmella. Polyelectrolytes and Nanoparticles. Springer-Verlag Berlin Heidelberg, 2007
7. Encyclopedia of Polymer science and Technology. Ed. H. F. Mark, exec. ed. J. I. Kroschwitz. V. 1-12. 3rd ed. Wiley-Interscience, 2003-2004

The names of consulting teachers	Science degree	Main scientific works published in a scientific field in last 5 year period
Saulutė Budrienė	Prof. dr.	<ol style="list-style-type: none"> <li>1. S. Maciulyte, I. Mamaviciute, A. Straksys, T. Kochane, S. Budriene. Polym. Bull. 2021, 78, 1867-1886.</li> <li>2. T. Kochane, I. Zabarauskė, L. Klimkevičienė, A. Strakšys, S. Mačiulytė, L. Navickaitė, S. Gailiūnaitė, S. Budrienė. Int. J. Biol. Macromol. 2020, 144, 544-552.</li> <li>3. T. Kochane, S. Budriene, S. Miasojedovas, N. Ryskevici, A. Straksys, S. Maciulyte, A. Ramanaviciene. Coll. Surf. A: Physicochem. Eng. Asp. 2017, 532, 436-443.</li> <li>4. S. Maciulyte, G. Gutauskiene, J. Niedritis, T. Kochane, S. Budriene. Chemija. 2017, 28 (1), 74-84.</li> <li>5. A. Di Martino, A. Pavelkova, S. Maciulyte, S. Budriene, V. Sedlarik. Eur. J. Pharm. Sci. 2016, 92, 276-286.</li> <li>6. A. Straksys, T. Kochane, S. Budriene. Food Chem. 2016, 211, 294-299.</li> <li>7. T. Krivorotova, A. Cirkovas, S. Maciulyte, R. Staneviciene, S. Budriene, E. Serviene, J. Sereikaite. Food Hydrocol. 2016, 54, 49-56.</li> </ol>

Certified during Doctoral Committee session on September 28<sup>th</sup>, 2021. Protocol No. 610000-KT-142.

Committee Chairman prof. habil. dr. Aivaras Kareiva