PhD STUDIES COURSE UNIT DESCRIPTION

Name of subject	Field of science, code	Faculty / Center	Department
Ionogenic Polymers	Chemistry N 003	Chemistry and Geosciences	Polymer Chemistry
Student's workload	**Credits**	**Student's workload**	**Credits**
Lectures		Consultations	2
Independent study	7	Seminars	

Course annotation

Classification of ionogenic polymers. Anionic and cationic polymeric materials. Polyelectrolytes and polyampholytes. Polymeric salts and ionenes. Ionites and ion exchange resins, mechanism of action, thermodynamics of ion exchange.

Peculiarities of the synthesis of ionogenic polymers. Control of molecular weight and copolymer composition. Controlled radical polymerisation of ionogenic monomers. Synthesis of polymeric gels and ionites. Interaction of ionogenic monomers with solvents, macromolecules and especial additives. Problems associated with isolation of ionogenic polymers from solutions and purification.

Theory of polyelectrolyte solutions. Ionisation constant, changes in Gibbs energy. Viscosity of polyelectrolyte solutions. Properties of polyampholytes, isoelectric and isoionic points. Interactions in the solutions of ionogenic polymers. Complexes of polyelectrolytes with low-molecular-weight compounds and surfactants. Polymer-polymer complexes, complementarity.

Investigation of ionogenic polymers. Determination of molecular weight and copolymer composition. Study of ionogenic polymers by potentiometric, viscometric, conductometric, light scattering, size exclusion chromatography and other methods. Application of ionogenic polymers in water treatment and oil mining. Ionogenic polymers in separation and purification technologies, biotechnology and biomedicine.

Reading list

1. S. Koltzenburg, M. Maskos, O. Nuyken. Polymer Chemistry, Springer, 2017.
2. P.C. Hiemenz, T.P. Lodge. Polymer Chemistry. 2nd ed. CRS Press, 2007.
3. A. B. Lowe and C. L. McCormick (eds.). Polyelectrolytes and Polyzwitterions: Synthesis, Properties, and Applications. Am. Chem. Soc., 2006.
4. Ph. Guerrero (ed.). Polyelectrolytes: Theory, Properties and Applications. Nova Science Pub. Inc., 2016.

The names of consulting teachers	Science degree	Main scientific works published in a scientific field in last 5 year period
Ričardas Makuška	Dr. (HP), Prof.	1. J. Jonikaite-Svegzdiene, A. Kudresova, S. Paukstis, M. Skapas, R. Makuska. *Polym. Chem.*, 2017, **8**, 5621–5632. 2. P. Radzevicius, M. Steponaviciute, T. Krivorotova, R. Makuska. *Polym. Chem.*, 2017, **8**, 7217-7228. 3. I. Dobryden M. Steponaviciute, V. Klimkevicius, R. Makuska, A. Dedinaite, X. Liu, R.W. Corkery, P.M. Claesson. *Langmuir*, 2019, **35**, 15515-15525. 4. V. Klimkevicius, M. Steponaviciute, R. Makuska *Eur. Polym. J.,* 2020, **122**, 109356. 5. M.Steponavičiūtė, V.Klimkevičius, R.Makuška. *Macromol. Chem. Phys.*, 2021, **222**, 2000364.

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Committee Chairman prof. habil. dr. Aivaras Kareiva