

Course title: Elements of physical chemistry of polymers – selectable / regular course

Number of contact hours: 30 hours (15h lectures, 15h laboratories)

ETCS credits: 2

Course description: Polymers are the most versatile and diversified modern materials. This group offers for example resistant structural materials for automotive or electronic industry, durable coatings, films and fibers as well as biodegradable drug carriers, hydrogels and tissue scaffolds on the other hand. The proper selection and control of material properties in the course of manufacturing and lifetime cycle requires knowledge of its physicochemical properties.

The lectures are focused on the structure-properties relationships in polymers and its compositions with high commercial meaning. Topics include hierarchical polymer structure, phase transitions, control of the mechanical, thermal, rheological and processing properties by physical modification.

Laboratories consist of training in polymer testing and practical approach to evaluation of physical phenomena, for example the influence of polymer solution concentration on its rheological properties, the role of crosslink density on resistance to solvents, the influence of nucleants and thermal annealing on polymer crystallization, the variation of polymer surface properties by ageing and modification.

Education effects (P7S_UW, P7S_WG):

- **knowledge:** student knows the hierarchical structure-properties relationship and describes the phase transitions in polymers; knows the methods of polymer testing;

- **skills:** student can carry out tests of the mechanical, thermal, rheological and surface properties of polymers using appropriate apparatus and set of parameters; student can explain the gathered results and trends in the context of the theoretical concepts; student prepares high-quality research report from performed laboratory exercises.

- **social:** student is able to work independently and in the group both at the laboratories and during preparation of the report; understand the role of engineer in controlling of polymer properties in order to fulfill the functional demands and quality standards.

Literature: M. Doi, "Introduction to Polymer Physics", Oxford Science, 1995; L.H. Sperling, "Introduction to Physical Polymer Science", Wiley-Interscience, 2006; M. Rubinstein and R. H. Colby, "Polymer Physics". Oxford University Press, 2003.

Assessment method: Final test, completing the laboratories (presence and delivering of reports from each performed exercise)

Prerequisites: Basic knowledge in physical chemistry and technology

Primary target group: All specialties students

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