

# **Polymers and their applications in tissue engineering**

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## **1. Polymers**

- general concepts, configuration and conformation of macromolecules, molecular weight,
- supermolecular structure of polymers (phases, molecular orientation),
- phase transitions in polymers,
- selected properties of polymers and methods of structure/properties investigations

## **2. Materials for medical applications**

- general classification, application areas, history and development perspectives

## **3. Extracellular matrix (ECM) in animal tissues**

- functions, chemical composition, architecture (morphology)
- the specificity of ECM in different types of tissues

## **4. ECM analogue formation for tissue reconstruction**

- requirements, synthetic and natural polymers used for formation of ECM analogues, ECM forming techniques

## **5. The importance of surface in biomaterials engineering**

- cell-material interaction in the context of surface properties
- parameters describing surfaces and surface testing methods
- surface modification techniques

## **6. Polymer nanofibers formed by electrospinning for tissue engineering applications**

- basic aspects of electrospinning, influence of process/materials parameters on nanofibers structure,
- nanofibers as scaffolds,
- nanofibers as carriers of biologically active substances

## **7. Hydrogels in tissue engineering**

## **8. Methods for testing a biocompatibility of materials in vitro conditions**

- analysis of cells adhesion and proliferation,
- cell cultures (cell lines)

## **9. Polymers in engineering of various tissues**

The total number of lecture hours – 30, laboratory exercises – 5, self-teaching – 30, direct tutoring and consultations – 20.

**Number of ECTS points: 3**