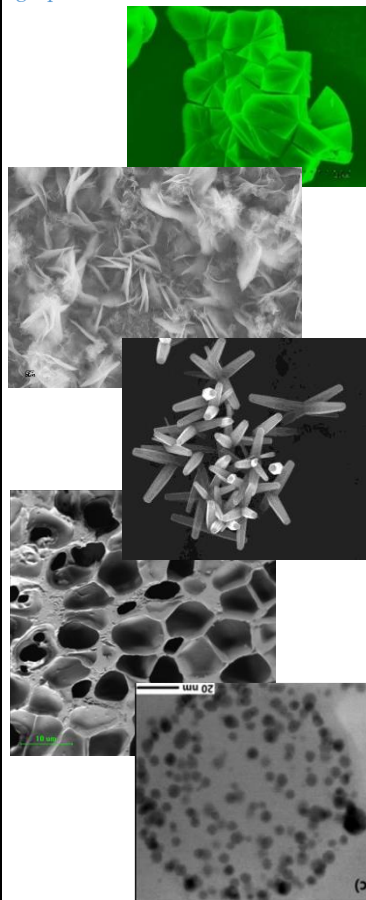




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<p>name of the unit:</p> <h2 style="text-align: center;">DIVISION OF FUNCTIONAL MATERIALS</h2> <p style="text-align: center;">Department of Molecular Physics, Lodz University of Technology</p>		<p>symbol:</p> <p style="text-align: center;"><b>K-31</b></p> <p style="text-align: center;"><a href="http://www.kfm.p.lodz.pl">http://www.kfm.p.lodz.pl</a></p>
<p>head of the unit:</p> <p style="text-align: center;"><b>Marcin Kozanecki, PhD, DSc, TUL Prof.</b></p>	<p>potential promoters:</p> <p>Marcin Kozanecki, PhD, DSc, TUL Prof. Lidia Okrasa, PhD, DSc, Aleksandra Wypych-Puszkarz, PhD Izabela Bobowska, PhD Paulina Filipczak, PhD Adam Łuczak, PhD</p>	<p>contact person:</p> <p style="text-align: center;"><b>Izabela Bobowska, PhD,</b> tel: 48-42-631-32-05 <a href="mailto:izabela.bobowska@p.lodz.pl">izabela.bobowska@p.lodz.pl</a></p>
<p>scope of activities:</p> <p>The research focuses on the correlations between the structure, intermolecular interactions and physical and physicochemical properties of various materials and functional nanomaterials (organic, including polymeric, inorganic and hybrid) and includes:</p> <ul style="list-style-type: none"> <li>- design, synthesis and characterization of new materials and nanomaterials with specific optical, photocatalytic, electrical, magnetic and barrier properties (e.g. transparent conductive layers, thin dielectric layers improving the efficiency of optoelectronic devices, multi-layer polymer composites with very low gas permeability);</li> <li>- design, production and characterization of new polymer systems sensitive to stimuli (temperature, pH, magnetic field) for biomedical and technical applications;</li> <li>- advanced spectroscopic studies of the structure (qualitative and phase analysis) and intermolecular interactions in functional materials.</li> </ul>		<p>graphic material</p> 
<p>present activities:</p> <ul style="list-style-type: none"> <li>- synthesis, characterization and analysis of electrical properties of hybrid composites based on poly(dimethylsiloxane) as a dielectric in thin film field effect transistors;</li> <li>- analysis of changes in the degree of hydration of the polymer during phase transitions in hydrogels made of poly(oligoether methacrylates) (PEOGMA) with different lengths of side groups;</li> <li>- photochemical synthesis and characterization of hydrogels based on poly (acrylic acid) as scavengers of heavy metals from the water environment;</li> <li>- developing a methodology for the early diagnosis of osteoarthritis with the use of spectroscopic methods;</li> <li>- characteristics of polymeric materials with brush topology for the treatment of osteoarthritis;</li> <li>- testing the barrier properties of various materials using the calcium test.</li> </ul>		
<p>Future activities:</p> <ul style="list-style-type: none"> <li>- synthesis and testing of the physicochemical properties of polymer organogels filled with ionic liquids (systems sensitive to the electric field as potential micro-actuators, artificial muscles)</li> <li>- analysis of the influence of the presence of hydrophobic comonomers on the physico-chemical properties of thermosensitive polymer gels based on PEOGMA</li> <li>- design and synthesis of new barrier materials with very low hydrogen permeability</li> </ul>		



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**Keywords:**

nanomaterials, nanoparticles, nanorods, nanolayers, nanocomposites, hybrid materials, stimulus-sensitive polymeric materials, hydrogels, organogels, barrier materials

**List of internship proposal in this research team:**

- synthesis and testing of physicochemical properties of polymer organogels filled with ionic liquids
- synthesis and testing of barrier properties of multi-layer polymer / metal oxide and polymer / graphene laminates

**List of attachments:**

from 2020 „Cartilage protection and regeneration consortium”, CaPreCon, EURONANOMED 2020-057 (ERA-NET, EURONANOMED3  
from 2019 „Nowe kopolimery typu Bottle-Brush, a choroba zwyrodnieniowa stawów” projekt OPUS (NCN)  
Wrzesińska, A. et al., „Effects of counter anions on AC and DC electrical conductivity in poly(dimethylsiloxane) crosslinked by metal-ligand coordination” (2021) Polymers, 13 (6), art. no. 956, DOI: 10.3390/polym13060956  
Budzałek K. et al., “Star polymers -TiO<sub>2</sub> nanohybrids to effectively modify surface of PMMA dielectric layer for solution processable OFETs” (2021) J. Mater. Chem. C, 9, 1269 – 1278, DOI: 10.1039/D0TC03137B  
Piechocki K. et al., “Water structure and hydration of polymer network in PMEO2MA hydrogels” (2020) Polymer 210 art. no. 122974, DOI: 10.1016/j.polymer.2020.122974