

<p style="text-align: center;">Peter the Great St. Petersburg Polytechnic University</p> 	<p style="text-align: center;">Leibniz University Hannover</p> 
<p style="text-align: center;">Higher School of Applied Physics and Space Technologies Institute of Physics, Nanotechnology and Telecommunications</p>	<p style="text-align: center;">Institute for Multiphase Processes</p>
<p style="text-align: center;">Ass. Prof. Dr. Viktoriia M. Kapralova</p>	<p style="text-align: center;">Prof. Dr-Ing. Birgit Glasmacher</p>
	
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BRIEF DESCRIPTION OF THE UNIT / RESEARCH GROUP

Our research group combines best knowledge and significant expertise of polymer physicists and biomedical engineers to develop and evaluate novel active polymer-based materials for application as smart sensors and customized, patient-specific medical implants for bone and nerve tissue regeneration.

WHAT WE OFFER / PROJECT DESCRIPTION

Science. The main scientific aim of the common project is to develop active medical implants and smart sensors. In this regard, we are working on development of a) new cross-linked segmented polysiloxane-urethane copolymers for engineering of patient specific bone implants with adjustable mechanical properties and b) poly(vinylidene fluoride-co-trifluoroethylene) (PVDF-TrFE) materials with piezoelectric properties for nerve tissue regeneration. The group conducts joint experiments using RAMAN/AFM microscope, dynamic mechanical testing machine, degradation tests as well as designs methods for precise measurement of piezoelectric modulus. In this context, we are also working on development of polymeric nanofibers with addition of polydiphenylene phthalide (PDP) with improved piezoelectric response and switching effect.

Education. Along with research and novel ideas in science and technology, we conduct joint educational activities for students. In this regard, Prof. Kapralova gives annual lectures on physics of polymers within a module “Biocompatible polymers” for the students at LUH. In addition, German partner Prof. Glasmacher gives a number of lectures during the Summer School in Saint Petersburg.

Exchange. We promote and support German and Russian students to participate in exchange within the project. The students are always welcome to participate in institutional life and take part in intercultural activities of the institutes. In this regard, Igor Katz, Master student from LUH, conducted a research stay in Saint Petersburg in 2016 and developed novel dynamic system to measure piezoelectric module. In turn, Artem Tretiakov, Master student from SPbPU, participated in the research project at IMP in 2018 and developed novel electrospun blend nanostructured fiber mats made of PVDF-TrFE and PDP with improved piezoelectric and switching effect.

KEYWORDS

Bone implants, nerve conduits, piezoelectric materials, PVDF-TrFE, switching effect, PDP, smart sensor

COLLABORATION OUTCOME

Active scientific and student exchange (in total 2), joint application for funding (in total 2), joint peer-review publications (in total 3) and participation at international conference with young scientists (in total 5 conferences with 5 joint contributions).