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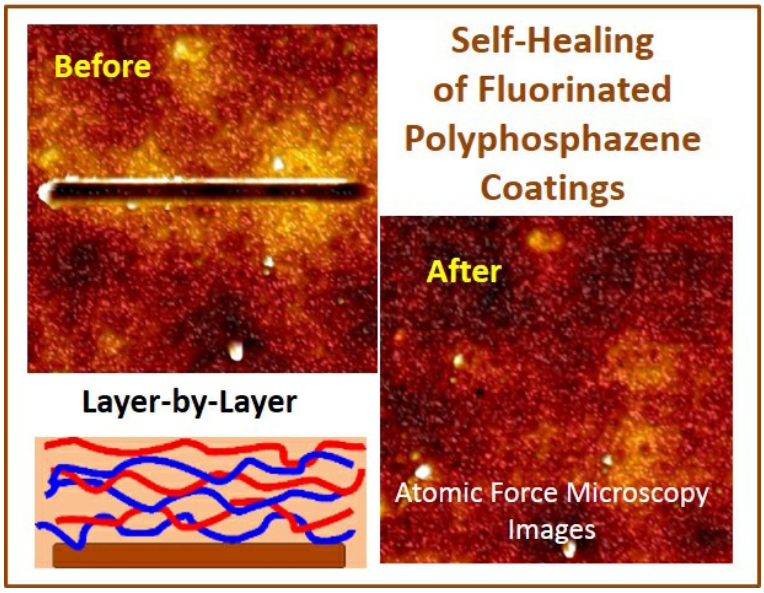
IBBR Researcher, Dr. Alexander Andrianov, Receives Funding for Two Collaborations



Collaborations will explore using two novel types of biofunctional synthetic macromolecules of the polyphosphazene (PPZ) family for exciting and very different applications. In the first, PPZs will be developed for use as biocompatible and drug-releasing hydrophobic coatings for indwelling medical devices. In the second, PPZ hydrogel nanoparticles will be evaluated for encapsulation of contrast agents to enhance mammography for breast cancer tumor detection.

(Rockville, MD, October 17, 2018) The surface of implanted medical devices -- like cardiac stents, catheters, and artificial joints -- are often coated with polymers that make them biocompatible, and sometimes also contain drugs for controlled release. Currently available coatings, however, do not fully prevent inflammation and undesirable tissue or bacteria growth. Dr. Andrianov and his collaborator Dr. Svetlana Sukhishvili, of Texas A&M University, have demonstrated that layer-by-layer (LbL) assembly of amphiphilic (containing both hydrophilic and hydrophobic components) PPZs can be employed to create nano-structured fluorinated coatings that display superior biocompatibility.

The Materials Research Division of the National Science Foundation, which supports research on the design, synthesis, and characterization of novel materials, recently awarded a grant to the team to advance this project. Their goal is to develop highly biocompatible, non-biodegradable hydrophobic coatings that are capable of controlled drug release. In addition, Dr. Andrianov says, “one of remarkable features that we have observed for these fluorinated coatings is their self-healing capabilities, which means that even minor damage to the film surface can ‘smooth itself out’, further decreasing the potential for unwanted tissue growth and bacteria build-up.”

In another collaboration, Dr. Andrianov is working with Dr. David Peter Cormode of Perelman School of Medicine at the University of Pennsylvania to apply PPZ technology toward earlier breast cancer detection. Dr. Cormode was recently awarded a National Cancer Institute (NCI) grant to develop contrast agents that will enhance breast imaging by a technique called dual-energy mammography. Dr. Andrianov’s subcontract with University of Pennsylvania will allow him to synthesize, purify, and characterize hydrophilic PPZs suitable for making hydrogel nanoparticles that will encapsulate contrast agents.

“In this project, we will be focusing on the synthesis of hydrophilic macromolecules with tailored biodegradability and “stealth” characteristics, which are needed to minimize recognition by the immune system and prolong their *in vivo* half-life. We expect that these specially-designed nanoparticles will accumulate in and highlight the existence and location of tumors, even in dense breast tissue,” notes Dr. Andrianov. The new silver-based contrast agents should be tolerated even by patients with sensitivities to current iodine-based agents, and will also be biodegradable, allowing them to be safely excreted.

About IBBR

IBBR is a joint research enterprise of the University of Maryland College Park, the University of Maryland Baltimore, and the National Institute of Standards and Technology. The Institute sits at the nexus of academic research and commercial application, bringing together critical elements necessary inspire transformative discoveries in the field of biotechnology that provide innovative solutions to major scientific and engineering challenges important to society. IBBR researchers seek to advance the fields of disease pathways and biomolecular targets, biomolecular measurements sciences, and biomolecular engineering including structure-based design of vaccines and therapeutics. The Institute also serves to expand the economic base of science and technology in the State of Maryland and at the national level. For more information, visit https://www.ibbr.umd.edu/.

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