Abstract for the general public in English

Title: Next-Generation Stretchable Gate Dielectrics for Organic Electronics: Ionic Gel–Based Solutions for Biomedical and Wearable Devices

In order to make future electronics more flexible, wearable, and suitable for contact with the human body, this project aims to create a new class of soft, elastic materials. The majority of modern electronic devices are inflexible and insufficient for uses like implanted sensors, electronic skin, and wearable health monitors. Although they present a promising alternative, stretchable electronics made of unique organic (carbon-based) materials still face significant technological obstacles.

One of the key problems addressed in this project is how to make a stretchable, soft insulating layer (referred to as a "gate dielectric") that keeps good electrical performance. In devices called organic field-effect transistors (OFETs), which function similarly to switches or amplifiers, this layer is crucial. Our goal is to replace conventional plastic-based insulators with cutting-edge "ionic gel" materials, which are gels made by mixing particular liquids with flexible polymers that resemble rubber. These gels can store electrical charge effectively and function at low voltages, which is crucial for wearable and biomedical devices' energy efficiency and safety.

The study includes fabricating functional OFET devices, testing and designing these novel materials in the lab, and assessing their performance under mechanical stress. The project will be implemented at the University of Technology in Lodz.

If the project is successful, it will help create next-generation flexible electronics that are safe, soft, and prepared for wearable and medical applications in addition to being long-lasting and high-performing. The findings may find use in soft robotics, personalized medicine, and digital healthcare.