Imagine the world of the “next generation”, where smart technologies will comprehend more and more aspects of our everyday life. Medical sensors, which are compatible with our body and allow to measure basic life functions; smart skin with integrated display on your wrist, showing you the latest news and weather forecast; cellphones and large displays, which can be rolled up or folded; fabrics, which can change their print depending on your mood and monitor your health parameters are only several possible examples of how such technology can improve our daily routine. What else can the world bring to us? The answer currently depends on efficient manufacturing of flexible devices that requires improved processes, tooling, and materials.

Lack of advanced materials is exactly one of the main barriers limiting further development of flexible devices due to the limited ability of presently existing materials to restore original properties upon mechanical damage. In turn, fabrication of highly stretchable organic field-effect transistors, which are essential elements of the stretchable electronic devices, with ability to self-healing upon being scratched or ruptured would open the way for creation of new cutting edge devices for above mentioned applications. The energy savings and biodegradability likely to be associated with most flexible electronics technologies will make major contributions to sustainability.

The main goal of this project is to create fully stretchable dielectric with enhanced self-healing properties, which are one of the main components of flexible electronic devices. Polymeric material crosslinked by dynamic non-covalent metal-ligand coordination is a new class of materials with significant potential to fulfill the above requirements. Project targets to systematical study of the influence of the metal cations and anions on the coordination mechanism of the metal-bipyridine in the poly(dimethylsiloxane) (PDMS) matrix, molecular structure of the synthesized materials, and resulting self-healing, and electrical properties. Additionally, computer calculations are used to correlate the obtained results with the coordination distance between different metal ions and bipyridine and get further inside into the molecular dynamic and electrical parameters.