Rapid growth and development at the intersection between electronics, engineering, biology and medicine has allowed for the creation of a new discipline, bioelectronics. Serving as the translators between the signals and functions of human body and external electronic processing systems, bioelectronic devices allow for the sensing, recording and monitoring of physiological states, as well as for their regulation. Bioelectronic devices can be already found in numerous applications, especially in neural tissue engineering as cochlear implants, neural stimulation devices to treat epilepsy or paralysis, and deep-brain stimulation devices to treat Parkinson disease. Although being a mature technology, bioelectronics still needs to face several challenges, including the implant-associated inflammation and scaring limiting the performance of the devices. Consequently, intensive research efforts have been made to develop advanced materials possessing superior electrochemical properties and biocompatibility.

The aim of the project is to expand the currently existing library of surface modifications suitable for use within bioelectronic interfaces by developing biofunctionalized organic monolayer coatings. The coating will be based on electrodeposited monolayers, which can form thin uniform film over the whole surface of electrode significantly changing its physicochemical properties and biocompatibility. By the further surface modification of as-formed coatings through biologically active molecules, we expect to assemble a versatile toolbox of coatings for addressing a variety of challenges related to the interface between biology and electronic systems. Combining the advantageous physicochemical properties of monolayer coatings together with their high tailorability for specific needs, we expect that the biofunctionalized organic monolayers developed in this project will serve as promising materials not only for neuroprosthetic coatings, but also for a variety of applications in the field of bioelectronic devices.