

Laboratory Practicals and Master Theses in the field of material science and neuromodulation

Department Chemie und Pharmazie, Erlangen, Vollzeit, Befristete Anstellung, Bewerbungsschluss: 31.08.2025

Your Tasks

Laboratory Practical (1): Polymer Coating and Streptavidin Labeling of Magnetic Nanomaterials

Task will be to optimize the surface functionalization of magnetic nanoparticles to improve stability and functionality for potential applications in the biomedical field. The work includes basic organic chemistry, bioconjugation techniques, and characterization of the coated nanomaterials using standard analytical methods. Duration: 3-6 weeks, Attendance can be arranged flexibly in accordance with the required lab work. Compatible with Bio-Organic and Bio-Inorganic Chemistry Lab (Modulnummer: 46514)

Master Thesis (1): Synthesis of Magnetic Nanomaterials

Master Thesis in the field of synthesis of magnetic nanomaterials. Anisotropic geometries in magnetic nanostructures have been described by our group (Gregurec et al., 2021) with properties highly desirable for application in mechanical neuromodulation. Spindle or tube shape like nanoparticles represent promising candidates, as their rotation can be induced through external magnetic field stress, while still presenting a favorable shape. The thesis will focus on the optimization of a hydrothermal reaction for the synthesis of nanotubes and nanospindles. The candidate will characterize the material and is expected to obtain a sound knowledge of crystal phase identification (QualX software, cell parameters calculations, Gaussian/Lorentzian fitting, etc.), magnetization curve analysis, and hands-on experience in sample preparation as well as basic TEM operation. The ideal candidate should have background in chemical synthesis and/or material science and a genuine interest in protocol development in material production, as well as an open-minded mentality, to work in a highly international and interdisciplinary team. This master thesis is integrated into a multidisciplinary project developing novel approaches for the treatment of neurodegenerative diseases, funded by the European Union's European Innovation Council HORIZON-EIC-PATHFINDER program.

Master thesis (2): Calcium imaging for assessing magnetoelectric nanoparticle actuation on neurons

Master Thesis project in the field of nanotechnology and neuro-stimulation. The project aims to demonstrate the functionality of magnetoelectric nanoparticles in vitro. Experiments will be performed using fluorescence microscopy techniques to track calcium flux during induced cellular stimulation. The candidate will acquire comprehensive understanding on magnetoelectric materials and ion channel activation, hands on experience in primary cell cultures of hippocampal neurons as well as a direct handling of a fluorescence microscope and image processing. Ideally the MSc candidate should have a background in cultivation of cells and previous experience on microscopy (optical or

fluorescent), as well as an open-minded mentality, to work in a highly international and interdisciplinary team. This master thesis is integrated into a multidisciplinary project developing novel approaches for treatment of neurodegenerative diseases, funded by the European Union's European Innovation Council HORIZON-EIC-PATHFINDER program.

Interessiert?

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