Plasmonic supported optical spectroscopy

Types of projects
Bachelor thesis, Thesis MSc, PhD

Short description
The aim of our research is to explore, to develop and to apply novel optical and spectroscopic strategies to study matter at the nanoscale and at the single molecule level. We follow a methodological approach, which exploits plasmonic resonances of metal nanoparticles resulting in enhanced and highly localized optical fields. Using these near-fields allows us to push spectroscopy to new limits in sensitivity, structural selectivity and lateral confinement. To realize all these potential capabilities, we also work on a comprehensive characterization and understanding of plasmonic nanostructures and their local electromagnetic fields.

We offer projects at different levels and of different types dealing with the topics:
Surface enhanced Raman scattering (SERS)
Surface-enhanced Fluorescence (SEF)
Surface enhanced IR absorption (SEIRA)
Combined optical and electron microscopy studies

Projects can be arranged in the following fields
- Characterization of plasmonic nanostructures and their local electromagnetic fields using optical and electron microscopy approaches
-Basic studies of one- and two-photon excited spectroscopy performed in local optical fields
-Ultrasensitive and single molecule spectroscopy
-Applications of SERS, SEF, and SEIRA to complex biological structures and to biomedical problems
-Applications of SERS, SEF, and SEIRA for spectroscopic studies on innovative nano-materials and –structures

Projects include experimental and theoretical work with emphasis to experiments and are suitable for students in the fields of physics, chemistry, biology, nanotechnology, electrical engineering.
Master projects can be arranged in a way that they can be extended and continued as PhD project.

Prerequisites
Interest in photonics
Strong interest in experimental challenges
Interest in interdisciplinary work

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