Nanogap Plasmonic Gratings with Sub-10 nm Gaps: Design, Fabrication and Characterization for Optoelectronic Applications

Background:

Nanogap plasmonic gratings with sub-10nm gaps have been extensively researched for their plasmonic nature and optoelectronic applications. These nanostructures, composed of noble metals, can harness surface plasmons, which are collective excitations of the conduction electrons, for extreme subwavelength localization of electromagnetic energy. They have been shown to enhance light-matter interactions, increasing absorption, emission, and surface-enhanced Raman scattering (SERS).

Objective:

Design and fabrication of sub-10 nm nanogap gratings with dissimilar metals and different dielectric spacers, e.g. (SiO_2, HfO_2, Al_2O_3, TiO_2)

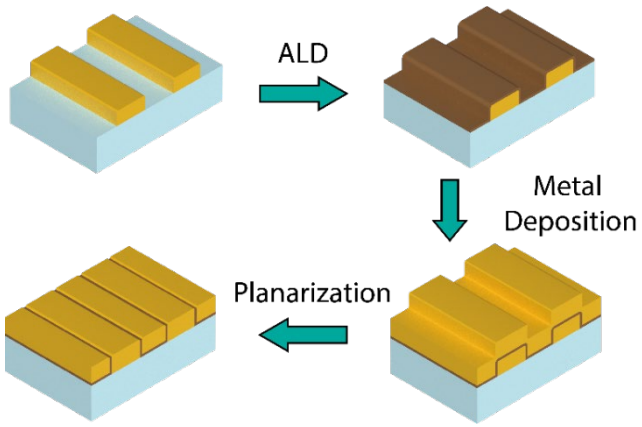

Figure 1: Fabrication process flow of 1D nanogap gratings

Methodology:

- Designing nanogap grating using RCWA simulations with in-house software
- Developing fabrication process flow and optimizing it
- Cleanroom activities such as metal-deposition, spin-coating and etching processes
- Spectroscopy for optically characterizing the samples
- Investigation of optoelectronic properties

Further Information and Application:

The proposed project aims to provide students with a comprehensive understanding of the plasmonic light-matter interactions and optoelectronic effects that arise from nanogaps within plasmonic gratings. Potential applications: sensing, metamaterials, and optoelectronics. Interested students should contact: Jeetendra Gour, jeetendra.gour@uni-jena.de