Einblicke in die Forschungsarbeit

FORSCHUNGSPROJEKT

„Crescent-based plasmonic nanostructures - fabrication and optical properties“

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Crescent-based plasmonic nanostructures - fabrication and optical properties

Eric Görlitzer graduated in the Elite Graduate Program “Advanced Materials and Processes” (MAP) at the Friedrich-Alexander-Universität Erlangen-Nürnberg. During this programme, students are required to work on a miniproject for about 250 to 300 hours at MAP related institutes. Eric Görlitzer conducted his miniproject and is now conducting his PhD research on plasmonic nanostructure in the laboratory of MAP chair Prof. Nicolas Vogel at the institute of Particle Technology.

Importance of Plasmonics

Plasmonics is a still emerging field, which studies the interaction of light – or in a more general sense of electromagnetic waves – with metallic nano structures in the scale or smaller than the wavelength. It gained attention recently, as the electric field can be enhanced by several orders of magnitude around such structures, making it versatile for methods of single and low concentration biomacromolecule detection. Here, an important subdiscipline aims to study and differentiate chiral molecules. Differentiating enantiomers is vital, as our body responses resolute to handedness, while one (R-Thalidomide) acts as a drug, the other (S- Thalidomide) causes birth defects.

Physics of plasmonic coupling

A fundamental requirement to let plasmonics help to tackle this problem, is to further understand the physics of plasmonic coupling. When plasmonic particles come close together, they start to interact, they begin to hybridize similar as known from molecules in chemistry, thus called plasmonic molecules. Similar as their (bio)macromolecular counterpart, they can have structural and optical chirality. Crescent shaped plasmonic structures have shown strong near-field enhancement, and can be produced easily by colloidal lithography. Further, stacking such gold crescents to a split-ring resonator gained insights into plasmonic hybridisation

Here, we continue to explore the interaction of such stereometamaterial. The role of magnetic and electric dipoles in the hybridisation is explained while twisting such complex crescent-based structures. This fundamental interplay will further help to understand the strong chiral dichroism of the large-scale structures.

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