Bio-mediated self-assembled plasmonics

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Abstract

Plasmonics is the science and technology exploiting the optical properties of surface free electrons in noble metals. After more than a decade of exploration of the properties of metallic films patterned by top-down lithographic approaches, the specific properties of metal nanoparticles have appeared to be relevant not only for sensing applications but also potentially for information processing using localized plasmons. Yet the challenges facing colloidal plasmonics are primarily the design of nanoparticles with specific spectral and spatial optical properties and their organization into ordered higher-scale architectures. The structural quality of superstructures resulting from self-assembly processes would immensely benefit from the exploitation of designed biomolecules.

This tutorial will be divided into four sections. The first one will provide background information on the achievements and challenges of both top-down and bottom-up approaches of plasmonics. Secondly, the confinement, enhancement of the electromagnetic field in individual or coupled nanoparticles will be exposed. We will then overview some strategies to build larger architectures from colloids by applying some simple principles of self-assembly. This will lead us to define the current challenges for which DNA origamis, peptide scaffolds and protein engineering may provide some of the most powerful tools for the future development of optical information processing down to the single nanometer-scale.

References

8. Imaging symmetry-selected corner plasmon modes in penta-twinned crystalline Ag nanowires by leakage radiation microscopy.