NANOSCIENCE COLLOQUIUM

Alternative Plasmonic Materials – Colloid Chemical Synthesis, Characterization and Properties

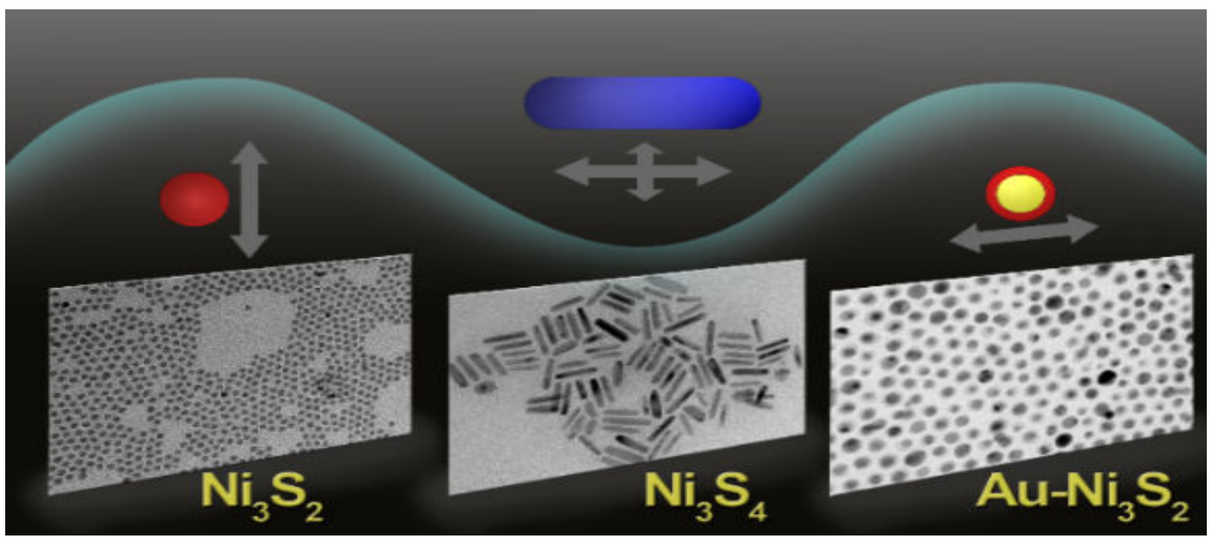
Prof. Dr. Dirk Dorfs

Universität Hamburg, Institut für Physikalische Chemie

A B S T R A C T : While most publications on plasmonic colloidal nanoparticles focus on gold or silver, many other materials are capable of exhibiting plasmonic behavior. The key requirement for the occurrence of a localized surface plasmon resonance (LSPR) is a sufficiently high free charge carrier density. In this presentation, we review our efforts in the colloidal chemical synthesis, structural, and optical characterization of these “alternative” (non-noble metal) plasmonic materials. We explore different material classes, such as degenerately doped semiconductors (e.g., Cu2-xSe) and metallic compounds (e.g., Cu1.1S and NiS). These materials display unique emergent properties, including the ability to synthetically tune the plasmon resonance post-synthesis and switch the plasmonic response via temperature changes.

Furthermore, we discuss ultrafast plasmon-plasmon interactions in dual plasmonic nanoparticles, such as Cu1.1S/Au systems, which show ultrafast hot carrier transfer.

Additionally, recent results on the fabrication of porous nanoparticle-based superstructures, achieved through a flash freezing approach followed by pulsed laser treatment, will be presented. This approach allows melting of the porous network while retaining its porosity.



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