Silica Particles with Plasmonic Silver Cores for Applications in Eukaryotic Cells

Ingrid Zeise[1], Daniela Drescher[1,2], Sören Selve[3], Janina Kneipp[1,2]

[1]Humboldt-Universität zu Berlin, Department of Chemistry,
Brook-Taylor-Str. 2, 12489 Berlin,Germany
[2]BAM Federal Institute for Materials Research and Testing,
Richard-Willstätter-Str. 11, 12489 Berlin, Germany
[3]Technische Universität Berlin, Zentraleinrichtung Elektronenmikroskopie (ZELMI),
Straße des 17. Juni 135, 10623 Berlin, Germany
*ingrid.zeise@chemie.hu-berlin.de

Nanostructures of gold or silver combined with silica shells (SiO_2@Au, SiO_2@Ag) are attractive systems for many applications as they combine the physical and chemical properties of two different materials. The plasmonic cores can serve as optical sensors, e.g., in analyses using surface-enhanced Raman scattering (SERS). It is well known, that the surface termination influences the interactions between biosystems and nanoparticles. By coating of the metal particles with a silica film, particles exhibit the same surface characteristics as pure silica yet preserve the plasmonic properties.

Here, we present results of the synthesis and characterization of plasmonic nanoparticles with silica layers of different thicknesses. As reported before, SiO_2@Ag nanostructures containing reporter molecules and thick silica shells can be applied as SERS labels. Here we investigate their cellular uptake and distribution in fibroblast cells and macrophages by SERS and cryo soft X-ray tomography. Prior to *in vitro* studies, the SiO_2 nanocomposites have to be well characterized with respect to layer thickness and stability in physiological solutions. Particle properties and their stability in cell culture medium are studied by transmission electron microscopy, UV-vis spectroscopy and dynamic light scattering.

We will further discuss SERS data obtained with SiO_2@Ag and SiO_2@Au nanostructures with shell thicknesses of very few nanometers. We compare the SERS spectra and X-ray microscopic images of SiO_2 nanocomposites in live cells with those of uncoated particles under identical experimental conditions.

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