Bifunctional silver / iron oxide nanostructures for the combination of magnetic separation and SERS

M. Gühlke[1,2], S. Selve[3], J. 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, Central Facility for Electron Microscopy (ZELMI), Straße des 17. Juni 135, 10623 Berlin, Germany

The combination of different materials in nanoparticles is leading to interesting multifunctional nanostructures. In nanomaterials that serve as substrates for surface-enhanced Raman scattering (SERS), one component is usually silver or gold in order to achieve the plasmonic properties which are necessary for the enhancement of Raman signals. As additional components, magnetic materials have gained increasing interest, for example for immunoassays, where specific separation prior to detection is needed.[1]

We have synthesized bifunctional nanostructures containing iron(III) oxide and silver. These nanostructures result from the reduction of silver ions in the presence of iron oxide nanoparticles. Their plasmonic properties are similar to those of pure silver nanoparticles. Furthermore, we show suitability for SERS-measurements with different analytes. The included iron oxide nanoparticles are magnetic, and therefore provide the possibility to specifically separate or enrich the combined nanostructures together with potentially attached molecules in a magnetic field. Subsequently, due to the local fields generated by the silver nanostructures, the adsorbed molecules can be detected by SERS. Such an experiment would be useful for the examination of adsorption and exchange processes on the nanoparticle surface, which is of interest for a better understanding of SERS.

References

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