SERS Micromapping as a Tool to Analyze the Two-dimensional Distribution of Molecules on Nanoparticle Arrays

Marina Gühlke and Janina Kneipp

Humboldt-Universität zu Berlin, Department of Chemistry, Brook-Taylor-Str. 2, 12489 Berlin, Germany

The Raman scattering of molecules which are adsorbed to plasmonic nanostructures is enhanced by several orders of magnitude because of the high local electromagnetic field in the proximity of the nanostructures. In surface-enhanced Raman-scattering (SERS), silver or gold nanoparticles are often used in suspensions. Diffusion and aggregation of these nanoparticles, however, lead to constraints in the reproducibility of the spectra, which is not beneficial in analytical applications. Nanoparticles which are immobilized on glass surfaces by organosilanes show homogeneous SERS enhancement at the microscopic level which gives the possibility to use SERS as a tool for the quantification of analytes.[1]
In order to investigate the potential of SERS microscopic imaging, we have created macroscopically defined regions, containing different analyte molecules, on two-dimensional arrays of immobilized silver nanoparticles and analyzed the microscopic distribution of different molecular species in mapping experiments. The obtained surfaces serve as a model system for the evaluation of SERS spectra from microstructured samples. Furthermore, the spatially resolved spectral information can give insights into the interaction of analyte mixtures with immobilized nanoparticles.

We acknowledge funding by ERC starting grant No. 259432 (MULTIBIOPHOT).

[1] V. Joseph, M. Gensler, S. Seifert, U. Gernert, J. P. Rabe, J. Kneipp, *J. Phys. Chem. C* 116, 6859-6865 (2012).