Novel nanoarchitectures for advanced surface-enhanced Raman scattering (SERS)

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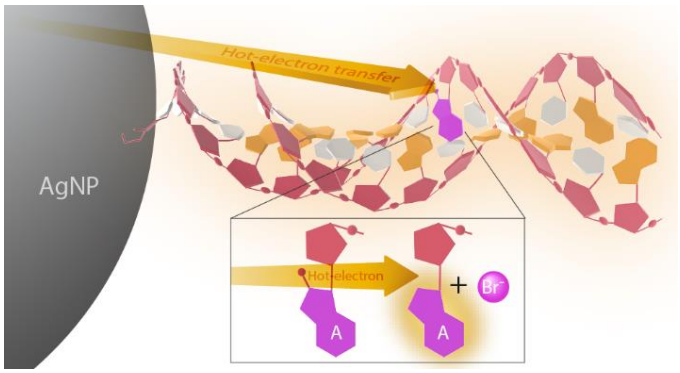
DNA origami nanostructures are ideally suited to arrange both plasmonic nanoparticles as well as receptors for analyte molecules with nanometer precision. Thus, they can be exploited for surface-enhanced Raman scattering (SERS), where the strongest signal enhancement is localized in nanometric hot spots and where the DNA origami can be used to precisely position the molecules of interest. In recent years we have demonstrated the few- and single-molecule SERS detection in different nanoparticle arrangements.[1]-[4] We have created a dedicated DNA origami nanoantenna,[4] which was also used to study chemical changes in hemin,[5] and to detect single proteins.[4]

In the presentation the further optimization of the nanoantenna will be demonstrated by comparing the SERS performance of dimers of different nanoparticle species from spherical Au and Ag nanoparticles to anisotropic gold nanoflowers and combinations thereof. A combination of Au nanoflower and Ag nanosphere allows for a broadband SERS excitation and improved single-molecule detection.

With these structures at hand we studied systematically how SERS spectra are modified when transitioning from bulk spectra over few molecules up to the single molecule level. Latest measurements from small molecules as well as proteins will be shown.

Finally, it will be demonstrated, how plasmon-induced chemical reactions can be monitored by SERS, using brominated nucleobases as an example.[6],[7]



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