DNA Origami Substrates Functionalized with Au-Ag-core-shell Nanoparticles for Highly Sensitive Surface-Enhanced Raman Scattering

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Our work aims at the single-molecule detection of analytes by combining DNA nanotechnology and plasmonics [1].
The DNA origami technique is used to create triangular templates for the precise arrangement of DNA-functionalized gold nanoparticles (AuNPs). By attaching two 40 nm AuNPs with a distance of 15 nm a localized hot spot appears that is suitable for the detection of surface-enhanced Raman scattering (SERS) from carboxytetramethylrhodamine (TAMRA) which is used as a Raman reporter molecule. In order to improve the signal enhancement within the visible range of the electromagnetic spectrum the size of the AuNPs is increased by means of electroless silver deposition resulting in Au-Ag-core-shell NPs.
By combining AFM (Fig. 1 (a) and (b)) and SERS imaging (Fig. 1 (c)) chemical and structural information of single DNA origami-AuNPs hybrids are correlated to associate certain signals with defined structures before and after the silver enhancement process.
After further optimization the system shall be applied for the detection of biomolecules.

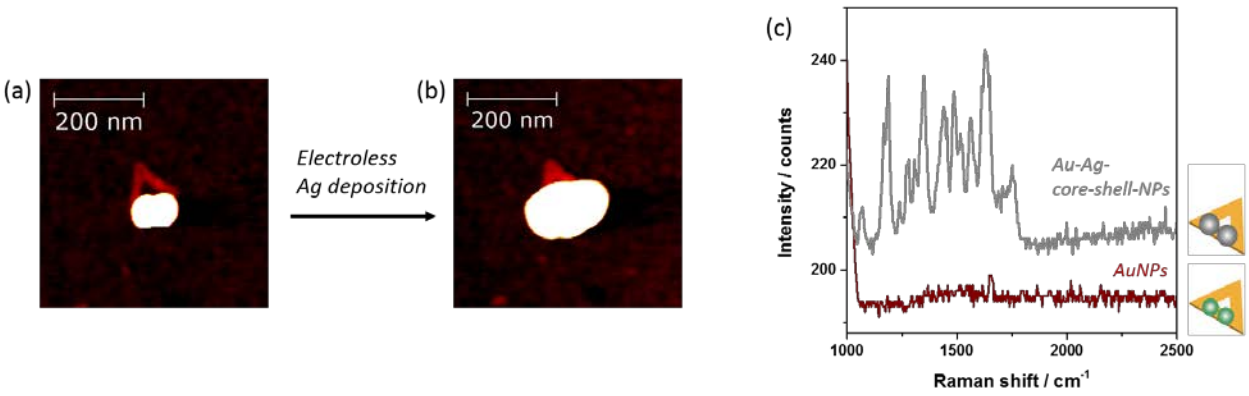

Fig. 1: *AFM images of DNA origami-AuNPs hybrids before* ***(a)*** *and after electroless silver deposition* ***(b)*** *as well as the corresponding SERS spectra* ***(c)****.*

[1] J. Prinz et al., J. Phys. Chem. Lett. 4 (2013) 4140−4145.