Gold nanolenses self-assembled by DNA origami for surface-enhanced Raman scattering

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Surface-enhanced Raman scattering (SERS) exploits the enhancement of electromagnetic fields in close vicinity of plasmonic nanostructures. The nanometer-scale spatial arrangement of plasmonic metal nanoparticles and analyte molecules has a significant effect on the observed signal enhancements and represents a great challenge in this technique. Especially interesting effects are expected for complex gold nanolenses (AuNLs), consisting of three or more differently-sized AuNPs. We use DNA origami to assemble AuNLs with 10, 20 and 60 nm AuNPs, arranged in three different geometries. Using correlated AFM and Raman spectroscopy, and probing single AuNLs, we systematically examined the SERS properties of the three different assemblies.

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