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SERS Plasmonic Enhancement using DNA Origami-based Complex Metallic Nanostructures[1] ANNE WATSON, MAURICIO PILO-PAIS, STEVEN DEMERS, Duke University, THOM LABEAN, North Carolina State University, GLEB FINKELSTEIN, Duke University — We construct Surface-Enhanced Raman Scattering (SERS) substrates using "DNA origami" templates. Using DNA complementarity, we selectively attach 5 nm gold nanoparticles at the corners of rectangular origami (∼100 nm in size). We then controllably enlarge them using in-solution silver deposition to create nanometer-sized gaps between the particles. The small gaps are responsible for the strong enhancement of the electromagnetic field ("hot spots"). We covalently attached Raman molecules (4-aminobenzenethiol) to the nanoparticles, and measured the Raman signal enhancement in the hot spots to be a factor of ∼100, compared to single nanoparticle samples which lack interparticle hot spots. We anticipate extending this technique by selectively placing molecules directly within the hot spots for single-molecule biosensor applications. Our method illustrates the functionality and versatility of utilizing DNA origami to rationally design and assemble plasmonic structures for molecular spectroscopy.

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