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**Surface Enhanced Infrared Absorption Spectroscopy (SEIRA) using Infrared resonant Au-nanoshell based substrates** JANARDAN KUNDU, HUI WANG, Department of Chemistry, Laboratory for Nanophotonics, FEI LE, PETER NORDLANDER, Laboratory for Nanophotonics, Department of Physics and Astronomy, NAOMI HALAS, Department of Chemistry, Laboratory for Nanophotonics, Department of Electrical and Computer Engineering — Enhancements of the molecular signals are known to occur in the mid-IR region when the molecules are in close proximity to rough metal surfaces. This phenomenon, known as surface enhanced infrared absorption (SEIRA), is complementary to surface enhanced Raman scattering (SERS) and can be used for biochemical sensing. However, designing substrates for SEIRA that are resonant in the mid-IR has proven challenging. One solution is to use metal nanoshells, plasmonic nanoparticles with a wide plasmon tunability range from the visible to the mid-IR. Here, we exploit this tunability property of nanoshells to fabricate nanoshell aggregates and nanoshell arrays as SEIRA substrates. Para-aminothiophenol (pMA) is used as a test molecule for studying SEIRA activity of these substrates. SEIRA enhancement factors are evaluated to be in the 10000 range for these substrates. These strong enhancements allow for sensing of biologically relevant molecules such as adenine. Spectral interpretation using SEIRA surface selection rule allows for insight into the molecule's preferred orientation on the nanoparticle surface.

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