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Spatially resolved micro-Raman spectroscopy on nanostructured surfaces[1] JED I. ZIEGLER, DIMITRI S. KOKTYSH, KEVIN A. TETZ, RICHARD F. HAGLUND, JR., Vanderbilt University — Surface-enhanced Raman scattering (SERS) is a promising technique for detecting weak molecular fingerprints for ultrasensitive chemical analysis. SERS arises from plasmonic electric field effects on surfaces with nanoscale asperities. We are using nanoparticles (NPs) and NP arrays tailored specifically for SERS in order to enhance sensitivity and correlate experimental result with finite-difference time- domain calculations of the nanoscale electromagnetic fields. Gold NPs and silver-gold core-shell NPs are prepared either by self-assembly into NP colloids or by lithographic fabrication into NP arrays on silicon substrates. Benzenethiol and other molecules with thiol groups are then spread on the NP-covered substrate where they bind to the gold surfaces of the NPs. Spatially resolved Raman spectra from NP colloids or single NPs with approximately 250 nm lateral resolution are obtained in a confocal inverted microscope configuration, while visible reflectivity measurements are used to correlate the location of the analyte molecules with particle morphology.

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