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Surface-Enhanced Raman Scattering Based on Novel Metal Nanostructures (Aggregates, Nanorods, and Nanoshells) JIN ZHANG, ADAM SCHWARTZBERG, LEO SEBALLOS, TAMMY OSHIRO, UC Santa Cruz, CHAD TALLEY, Lawrence Livermore National Lab, REBECCA SUTPHEN, University of South Florida, YIPING ZHAO, University of Georgia Athens — Rational design and study of new surface enhanced Raman scattering (SERS) substrates is key to advancing chemical and biological sensing. The next generation of biological probes will ideally be single, small, SERS active nanostructures able to penetrate the inner workings of cells. To this end, we have developed various metal nanostructures based on aggregates, nanorods, and nanoshells with the goal to optimize their SERS activities. We have very recently demonstrated SERS from single, hollow nanostructures. Exceptional sample homogeneity leads to a nearly tenfold increase in signal consistency over standard silver substrates. At 30 nm in diameter, this is the smallest confirmed single SERS active particle ever reported, representing a major step in advancing sensing technology based on SERS. In the meantime, we have applied some of the substrates developed in detection of cancer biomarkers and have achieved high sensitivity and molecular selectivity. The results have shown that SERS is extremely promising for chemical and biological sensing and imaging applications. To control the structure of the nanomaterials and thereby their optical absorption as well as SERS properties is critical for these emerging technological applications.

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