



SERS Studies with Templated Self-assembly Systems

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Surface enhanced Raman spectroscopy is an analytical technique with high sensitivity and high chemical differentiation power. However, enhancing surfaces are difficult to design. The effect relies on strong localization of electric fields by surface plasmons, which can be achieved in the gaps between adjacent metallic nanoparticles. Templated self-assembly of gold nanospheres and silver nanocubes was used to generate SERS substrates with useful attributes to demonstrate the relationship between structure and plasmonic properties. Assembly of the nanoparticles was mediated by lithographically-patterned substrates containing arrays of pores in pre-determined locations or by block-copolymer films with hydrophobic and hydrophilic domains. We utilized electric fields, capillary forces, or electrostatic interaction to place and cluster the nanoparticles in a controlled fashion. We demonstrate the strong link between SERS enhancement and interparticle distance, nanoparticle cluster orientation and relative alignment between particles in small clusters. Furthermore, experiments and calculations make a strong case for the central role surface plasmon resonances have in mediating between the nanoparticle geometry and the far-field spectroscopy.

Dr. Oded Rabin is Assistant Professor of Materials Science and Engineering and IREAP at University of Maryland. He graduated from the Technion – Haifa, Israel in 1996, and received a M.Sc degree in Chemistry from the Weizmann Institute of Science – Rehovot, Israel in 1998. He worked on his dissertation with Prof. Mildred Dresselhaus at MIT and received his Ph.D. in Physical Chemistry in 2004. Dr. Rabin took postdoctoral positions at Harvard Medical School applying nanotechnology materials in medical imaging research and at UC-Berkeley studying thermoelectric properties of materials. He joined UMD in 2007. His research interests include Electrical and Thermal Transport in Low Dimensional Systems, Nanoporous Membranes, Biomedical Contrast Agents, and Plasmonics. He authored 26 journal articles, 5 book chapters, 2 U.S. patents and 2 patent applications.

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