Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Self-assembling Gold Nanoparticle Monolayers in a Three-phase System – Overcoming Ligand Size Limitations[1] GUANG YANG, Florida AM University - Florida State University College of Engineering, Department of Chemical and Biomedical Engineering, JAGJIT NANDA, Materials Science Technology Division, Oak Ridge National Laboratory, BOYA WANG, GANG CHEN, Florida AM University - Florida State University College of Engineering, Department of Civil and Environmental Engineering, DANIEL T. HALLINAN JR., Florida AM University - Florida State University College of Engineering, Department of Chemical and Biomedical Engineering — An effective self-assembly technique was developed to prepare centimeter-scale monolayer gold nanoparticle (Au NP) films of long-range order with hydrophobic ligands. Aqueous Au NPs were entrapped in the organic/aqueous interface where the Au NP surface was in situ modified with different types of amine ligands, including amine-terminated polystyrene. The Au NPs then spontaneously relocated to the air/water interface to form an NP monolayer. The spontaneous formation of an Au NP film at the organic/water interface was due to the minimization of the system Helmholtz free energy. Self-assembled Au NP films has a hexagonal close packed structure. The interparticle spacing was dictated by the amine ligand length. Thus-assembled Au NP monolayers exhibit tunable surface plasma resonance and excellent spacial homogeneity of surface-enhanced Raman-scattering. The "air/water/oil" self-assembly method developed in this study not only benefits the fundamental understanding of NP ligand conformations, but is also promising to scale up the manufacture of plasmonic nanoparticle devices with precisely designed optical properties.

[1]This study was financially supported by start-up funding supplied by the Florida State University and the FAMU-FSU College of Engineering.

Guang Yang
Florida A
M Univ., - Florida State Univ., College of Engineering

Date submitted: 20 Nov 2016 Electronic form version 1.4