Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Multiphase microfluidics and Surface Enhanced Raman Spectroscopy CHRYSAFIS ANDREOU, Biomolecular Science and Engineering, UCSB, SEUNG JOON LEE, Chemistry Department, UCSB, BRIAN PIOREK, Mechanical Engineering Department, UCSB, MARTIN MOSKOVITS, Chemistry Department, UCSB, CARL MEINHART, Mechanical Engineering Department, UCSB — A two-phase microfluidic device is used to control the concentration and distribution of small numbers of silver nanoparticles in droplets, for experiments using Surface Enhanced Raman Spectroscopy (SERS). SERS is a widely used method that can allow detection and identification of trace quantities of chemicals, such as explosives or biological agents. Silver particles can be made to aggregate in the presence of an analyte, to create areas of intense electric field, called "hot spots," and give out a SERS signal about 10 orders of magnitude stronger than traditional Raman spectroscopy. The mechanism of enhancement is theorized to depend on the number of particles forming the aggregate. By using a two-phase microfluidic system, small Poisson-distributed numbers of silver particles are confined in aqueous droplets and mixed with an analyte. In this way we explore the dependency of SERS intensity on the number of SERS-active particles in each droplet, thus enabling the detection and identification of single molecules in droplets.

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Date submitted: 06 Aug 2010 Electronic form version 1.4