

Abstract Submitted  
for the DFD11 Meeting of  
The American Physical Society

**Thermally-Induced Mixing of Microscale Droplets for Detection of Gas-Phase Analytes** MEYSAM BARMİ, CHRYSAFIS ANDREOU, MEHRAN HOONEJANI, BRIAN PIOREK, MARTIN MOSKOVITS, CARL MEINHART, University of California Santa Barbara — In this talk, we investigate the absorption and mixing kinetics inside of sessile droplets, subject to a specified temperature gradient and evaporation rate. Such microscale droplets have free-surface interface that enables the adsorption of airborne molecules and their subsequent identification by Surface Enhanced Raman Spectroscopy (SERS). A droplet of SERS-active colloidal suspension can be mixed efficiently with the adsorbed analyte due to the Marangoni effect. This stimulates an aggregation process that results in the creation of the so called “SERS hotspots.” The droplets are interrogated using a Raman spectrometer to obtain highly sensitive and specific analyte detection. Efficient mixing is critical for practical measurements in many chemical and biological applications. We investigate specified thermal gradients and evaporation rates for precision mixing, and optimize these parameters for high-performance vapor detection. Numerical simulations using COMSOL Multiphysics are used to investigate droplet dynamics, by predicting fluid motion and analyte-induced aggregation kinetics. For the velocity field inside of the sessile droplet, Micro-PIV experiments are used to validate the numerical simulations. The system is tested using gas phase 4-Aminobenzenethiol as a model analyte.

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Date submitted: 12 Aug 2011

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