Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Free-surface digital microfluidic systems for optimized SERS analysis in gas chromatography BRIAN PIOREK, CHRYSAFIS ANDREOU, SEUNG JOON LEE, MARTIN MOSKOVITS, CARL MEINHART, University of California, Santa Barbara — A gas/liquid digital microfluidic platform was developed to chemically analyze gaseous analyte streams eluting from separation columns common in gas chromatography. The digital microfluidic stream is comprised of compartmentalized gaseous eluent packets segmented by SERS-active nanoparticles which are suspended within an aqueous phase. The microfluidic system is designed to optimize gaseous analyte transport into the SERS-active phase for chemical detection and analysis. Microfluidic and gas-phase flow patterns are controlled to produce reliable nanoparticle aggregation, resulting in SERS hot spots responsible for the PPT-level gas analysis mechanism. Since the flowing eluent is packetized by aqueous partitions, its spatiotemporal location can be controlled for effective analysis by SERS of nanoparticle hot-spot clusters occurring within individual partitions.

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Date submitted: 06 Aug 2010 Electronic form version 1.4