Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Gas-Liquid Droplet Microfluidics CARLOS HIDROVO, BRIAN CARROLL, The University of Texas at Austin — The possibility of replacing the highly viscous continuous phase oil for a less viscous gaseous phase offers opportunities for higher flow rates, reduced pumping power, and increased droplet inertia for high speed mixing applications. Liquid droplet generation in a gaseous microflow, however, is often characterized as unwieldy, difficult, and less forgiving compared to aqueous droplet generation in silicon oils. Creating droplets in common microchannel geometries, such as T-junctions and flow focusing arrangements, is undoubtedly possible but the metamorphosis of topology, such as spherical droplets, asymmetrical slugs, trailing pears, and liquid threads is significantly different than liquid-liquid flows. This presentation addresses the fundamental operation of liquid droplet generation in a confined gaseous microflow. Droplet volume, shape, and generation rates are experimentally characterized for common and not-so common microchannel geometries. Transitions from slugs to pools to films for T-junctions and dripping to jetting to threading for flow focusing are identified. High speed images are used to quantify the discrete phase characteristics and qualify the generation and detachment process.

Carlos Hidrovo
The University of Texas at Austin

Date submitted: 08 Aug 2011 Electronic form version 1.4