Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

**Dissolution without shrinking: a microfluidic study of multicomponent gas bubble dissolution** SUIN SHIM, Princeton University, JIANDI WAN, Rochester Institute of Technology, SASCHA HILGENFELDT, University of Illinois, HOWARD STONE, Princeton University — Spherical $CO_2$ bubbles generated in a flow-focusing microfluidic channel first shrink rapidly, and reach an equilibrium size. In the first – rapid dissolution – regime, the time needed for the bubbles to shrink in the channel is 30 ms regardless of surfactant concentrations in the liquid phase. After 30 ms following generation, all bubbles stop shrinking and reach an equilibrium radius, which varies with the surfactant concentration. We interpret the results by considering three major factors: interfacial tension, effects of other gases ($O_2$, $N_2$) that are already dissolved in the liquid phase, and the pressure drop along the channel. Our theoretical model, based on multicomponent 1D (radial) diffusion model, explains both shrinking and equilibrium regimes with different dissolution behavior of three gases and composition changes inside the bubble. We solve the model for a single gas bubble in an infinite liquid phase where the pressure changes with time, and compare with our experimental results.

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Date submitted: 26 Sep 2012 Electronic form version 1.4