Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Break-up of droplets in a concentrated emulsion flowing through a narrow constriction[1] SINDY TANG, LIN FAN, YUNHAN CHEN, LIAT ROSENFELD, Stanford University — We describe the break-up of droplets in a concentrated emulsion during its flow as a 2D monolayer in a microchannel consisting of a narrow constriction. Analysis of the behavior of over 4000 drops shows that the number of break-ups increases with increasing flow rate, entrance angle to the constriction, and size of the drops. As single drops do not break at the highest flow used, break-ups arise primarily from droplet-droplet interactions. Droplet-droplet interactions are stochastic; they cause fluctuations in the local strain rate and deformation each drop experiences. Analysis of droplet properties at a temporal resolution of 10 microseconds makes it possible to relate drop deformation with break-up probability. Similar to previous studies on single drops, no break-up is observed below certain critical flow rates and droplet deformations. Unlike previous studies, however, not all drops break above the critical values. Instead, the probability of break-up increases with flow rate and the local deformation of the drops.

[1]We acknowledge funding from the Stanford Woods Institute for the Environment, the California Sea Grant Project through NOAA's National Sea Grant College Program, and the Donors of the American Chemical Society Petroleum Research Fund.

Sindy Tang
Stanford University

Date submitted: 10 Jul 2013 Electronic form version 1.4