Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Breakup of double emulsions in wedge-shaped microfluidic channels[1] JIANG LI[2], University of Science and Technology Beijing, HAOSHENG CHEN[3], Tsinghua Univeristy, HOWARD A. STONE, Princeton University — Double emulsion droplets can serve as drug delivery vehicles and individual compartments for chemical reactions, and such materials are relevant to new kinds of microfluidic applications. We study experimentally the dynamics and breakup of double emulsion droplets flowing through poly(dimethylsiloxane) (PDMS) channels. As water-in-oil-in-water (W/O/W) double emulsion droplets flow through such wedge-shaped channels, the breakup of the droplets is controlled by the capillary number and the droplet-to-orifice size ratio. We obtain a phase diagram of droplet breakup morphology from the experimental results, and explain the results via a combination of the capillary instability and thin film dynamics. The phase diagram is useful for predicting and controlling the breakup of the droplet. Finally, differences between results obtained in PDMS channels and capillary channels are discussed.

[1]Supported by NSFC Projects (No. 50805008 and 50975158) and Fundamental Research Funds for Central Universities (FRF-TP-09-013A)
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Date submitted: 05 Aug 2010 Electronic form version 1.4