Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Coalescence of Droplets in Microfluidic Channels GORDON CHRISTOPHER, JOEL BERGSTEIN, NICOLAS END, SHELLEY ANNA, Carnegie Mellon University — The use of droplets as tiny reactors and sample transporters in lab on a chip devices is a concept that has been explored recently due to its potential advantage in precisely controlling discrete, tiny sample volumes. However, to realize the full potential of these devices, other chip operations need to be developed, for example the merging of multiple droplets for mixing or reacting disparate samples.. Coalescence in microfluidics is reported to be difficult, and indeed we observe that droplet collisions are more likely to lead to splitting of droplets rather than merging. We present a phase diagram in terms of the capillary number and droplet size indicating conditions under which coalescence will occur. We also examine the scaling behavior of contact time of the drops, relating this to timescales for film drainage in conventional experiments and timescales for propagation of interfacial instabilities. Finally, we examine the influence of collision angle on the ability for drops to coalesce.

Shelley Anna
Carnegie Mellon University

Date submitted: 03 Aug 2006 Electronic form version 1.4