Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Stability of confined conflowing jet at low Reynolds number. Theory and Experiments in microfluidic devices. ANNIE COLIN, Université Bordeaux 1, PIERRE GUILLOT, ARMAND AJDARI, CNRS — We adress the question of the stability of a confined coflowing jet at low Reynolds number in various geometry. Our study is motivated by recent experiments in microfluidic devices. When immiscible fluids flow in microchannels, monodisperse droplets or parallel flows are obtained depending upon the flow rate values of the aqueous phase and the oil phase. In these experiments, the confining and the shape of the geometry play a fundamental role. Analysing the stability of the jet in the framework of the lubrication at low Reynolds number, we link the transition between the droplets regime and the jet regime to the absolute/convective transition of the Rayleigh instability. The effect of the shape of the geometry, of the position of the jet in the microfluidic devices are discussed. Analytical solutions are presented in circular geometry and numerical computations are performed for others geometry. A very good agreement between our model and the experiments is found without any adjustable parameters, for fluids with various viscosity and various surface tension.

Annie Colin
Universite Bordeaux 1

Date submitted: 31 Jul 2006 Electronic form version 1.4