Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Microfluidic synthesis of crimped fibers JANINE NUNES, Princeton University, HANNAH CONSTANTIN, Yale University, TALAL AL-HOUSSEINY, HOWARD STONE, Princeton University — Flexible high aspect ratio microstructures, such as microfibers, are of considerable interest for potential textile, rheological and life science applications. This research is focused on the microfluidic synthesis of wavy or crimped polymeric microfibers. It is known that highly viscous liquid threads sheathed by a low viscosity continuous phase liquid can buckle when allowed to flow through a microchannel where there is an increase in channel cross-sectional dimensions. These structures are transient and evolve during flow to form piles, relax to straight threads or coalesce. Here we present the first example where buckling is triggered by the initiation of a polymerization reaction in a liquid thread that does not initially exhibit buckling (because of the low viscosity ratio between thread and continuous phase), and the subsequent preservation of the buckled morphology through completion of the crosslinking reaction. The resulting microfibers have highly uniform and reproducible morphology. By changing the location in the channel where the reaction is initiated, as well as the flow rates, the degree of waviness of the microfibers can be controlled. Current efforts are focused on developing a physical understanding of this process.

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Date submitted: 03 Aug 2012 Electronic form version 1.4