Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Microfluidic assembly of multiscale soft materials LIAN LENG, AXEL GUENTHER, University of Toronto — The vast majority of materials found in nature are characterized by length scales that span several orders of magnitude. Material properties such as porosity, permeability and elasticity are therefore locally and directionally tuned to their (biological) function and adapted to local environmental conditions. We use a massively scaled microfluidic approach to synthetically define multiscale complex fluids and soft materials with precisely tunable, non-isentropic bulk properties. Two or more fluids are separately introduced to the device that consists of fifteen vertically bonded and fluidically connected substrate layers, and guided to an exit section that either consists of 23 equidistantly spaced channels or a 23 x 15 channel array. The flow rates through individual channels are computer-controlled. Upon entering a reservoir in a flow-focusing configuration, a spatially organized fluid with characteristic length scales of 250 microns and 10 mm was defined, and retained via a chemical reaction. To illustrate different soft material morphologies in one, two or three directions, we demonstrate the formation of isolated fibers (1D); planar graded and barcoded materials (2D); graded bulk materials and perfusable matrices (3D).

Lian Leng
University of Toronto

Date submitted: 06 Aug 2010 Electronic form version 1.4