Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Ordered Patterns of Liquid Crystal Toroidal Defects by Microchannel Confinement YOULI LI, MYUNG CHUL CHOI, THOMAS PFOHL, JACOB N. ISRAELACHVILI, CYRUS R. SAFINYA, University of California Santa Barbara, ZHIYU WEN, Chongqing University, China, MAHN WON KIM, Korean Advanced Institute of Science and Technology — We present the first experimental results demonstrating a novel approach to controlling the size as well as the spatial patterning of defect domains in a smectic liquid crystal by geometric confinement in surface modified microchannels. By confining the liquid crystal 8CB (4'-octyl-4-cyanobiphenyl) in micron sized rectangular channels with controlled surface polarity, we were able to generate defect domains that are not only nearly uniform in size but also arranged in quasi-two-dimensionally ordered patterns. Atomic force microscopy measurements revealed that the defects have a toroidal topology, which we argue is dictated by the boundary conditions imposed by the walls of the microchannel. We show that the defects can be considered as colloidal objects, which interact with each other to form ordered patterns. This method opens the possibility to exploit the unique optical and rheological properties associated with LC defects to making new materials. For example, the control of the shape, size and spatial arrangement of the defects at the mesoscale suggests applications in patterning, templating, and when extended to lyotropic liquid crystals, a process leading to uniform size spherical particles for chemical encapsulation and delivery (Work supported by NIH GM-59288, NSF DMR-0203755 and ONR N00014-00-1-0214)

Youli Li
University of California Santa Barbara

Date submitted: 26 Nov 2004 Electronic form version 1.4