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Defects in liquid crystal nematic shells A. FERNANDEZ-NIEVES, A.S. UTADA, V. VITELLI, D.R. LINK, D.R. NELSON, D.A. WEITZ, Harvard University — We generate water/liquid crystal (LC)/water double emulsions via recent micro-capillary fluidic devices [A. S. Utada, et.al. Science 308, 537 (2005)]. The resultant objects are stabilized against coalescence by using surfactants or adequate polymers; these also fix the boundary conditions for the director field n. We use 4-pentyl-4-cyanobiphenyl (5CB) and impose tangential boundary conditions at both water/LC interfaces by having polyvinyl alcohol (PVA) dispersed in the inner and outer water phases. We confirm recent predictions [D. R. Nelson, NanoLetters 2, 1125 (2002)] and find that four strength s=+1/2 defects are present; this is in contrast to the two s=+1 defect bipolar configuration observed for bulk spheres [A. Fernandez-Nieves, et.al. Phys. Rev. Lett. 92, 105503 (2004)]. However, these defects do not lie in the vertices of a tetrahedron but are pushed towards each other until certain equilibration distance is reached. In addition to the four defect shells, we observe shells with two s=+1 defects and even with three defects, a s=+1 and two s=+1/2. We argue these configurations arise from nematic bulk distortions that become important as the shell thickness increases. Finally, by adding a different surfactant, sodium dodecyl sulphate (SDS), to the outer phase, we can change the director boundary conditions at the outermost interface from parallel to homeotropic, to induce coalescing of the two pair of defects in the four defect shell configuration to yield two defect bipolar shells.

Alberto Fernandez-Nieves

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