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Nanoparticle Diffusion and Aggregation in 2D Smectic Membranes[1] KYLE MEIENBERG, GREG SMITH, CHEOL PARK, JOSEPH MACLENNAN, MATTHEW GLASER, NOEL CLARK, University of Colorado — We observe directly the diffusion and aggregation of nanoparticles embedded in thin, freely-suspended smectic films using reflected light microscopy in order to better understand the hydrodynamics of inclusions in finite, two-dimensional fluids. The Saffman-Delbrück (SD) model has been used previously to describe the diffusion of micron-sized objects in thin membranes in a variety of experimental systems. Nano-sized Buckyball aggregates embedded in smectic A films are observed to have much faster diffusion rates than predicted by SD theory. These experiments suggest that SD theory breaks down in the limit of nanometer-scale inclusions where molecular diffusion processes are dominate.

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