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Flow Velocity Profiles in Actively-Driven 2D Nozzle Experiments using Freely-Suspended Smectic Liquid Crystal Films[1] EVAN DUTCH, CORRINA BRIGGS, KYLE FERGUSON, ADAM GREEN, CHEOL PARK, MATT GLASER, JOE MACLENNAN, NOEL CLARK, Physics Department and Soft Materials Research Center, University of Colorado — Freely-suspended smectic A liquid crystal films have been used to explore a large range of interesting flow phenomena. Passive microrheology experiments have confirmed previously that such films are ideal systems with which to investigate two-dimensional (2D) hydrodynamics. Here we describe an experiment that uses smectic films to study actively-driven 2D flows. Flow excited by blowing air over a film of smectic liquid crystal material containing small inclusions is captured using digital video microscopy. The flow fields are extracted using particle imaging velocimetry. We have measured the velocity field generated by flow through a thin nozzle into a large rectangular reservoir and compared this to a theoretical model based on 2D complex potential flows. The observations confirm that there is parabolic flow in straight channels, and that the theory accurately models the film velocity flow field in the reservoir.

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