Abstract Submitted
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Island Diffusion in Freely Suspended Smectic A Films: Crossover From 2D to 3D Behavior[1] ZOOM NGUYEN, MARKUS ATKINSON, CHEOL PARK, JOSEPH MACLENNAN, MATTHEW GLASER, NOEL CLARK, University of Colorado — Measuring the diffusion constant has been an important tool in studying the hydrodynamics of two-dimensional (2D) systems. The well-known Saffman equations predict how the diffusion of an inclusion in a 2D fluid film depends on the inclusion's size. For inclusions with radius R large compared to the characteristic Saffman length l_S, the fluid bounding the two dimensional system needs to be considered, rendering it effectively a 3D problem, and the diffusion constant varies as 1/R. In the 2D limit (if $R << l_S$), it varies as ln(1/R). We present here a clean two-dimensional system using freely suspended smectic A liquid crystal films that allows us to test this behavior in both regimes. By tracking the self-diffusion of single islands (thicker, circular domains embedded in the films), we are able to calculate the diffusion constant. The sensitivity of the measurement also allows us to detect the hydrodynamic interactions between islands.

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