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Mutual Diffusion of Inclusions in Freely-Suspended Smectic Liquid Crystal Films[1] TATIANA KURIABOVA, Brown University, ZHIYUEN QI, ZOOM NGUYEN, CHEOL PARK, MATTHEW GLASER, JOSEPH MACLENNAN, NOEL CLARK, University of Colorado, THOMAS POWERS, Brown University — We study experimentally and theoretically the hydrodynamic interaction of pairs of circular inclusions in two-dimensional, fluid smectic membranes suspended in air. By analyzing their Brownian motion, we find that the radial mutual mobilities of identical inclusions are independent of their size but that the angular coupling becomes strongly size-dependent when their radius exceeds a characteristic hydrodynamic length. The observed dependence of the mutual mobilities on inclusion size is described well for arbitrary separations by a model that generalizes the Levine/MacKintosh theory of point-force response functions and uses a boundary-element approach to calculate the mobility matrix.

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