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Autophobing on a liquid substrate[1] ELLEN PETERSON, STEPHEN GAROFF, ROOMI KALITA, RAMANKUR SHARMA, Carnegie Mellon University
— When a drop of fluid is deposited on another fluid it may either completely spread over the underlying fluid or it may reach an equilibrium shape, assuming the two fluids are immiscible. The choice of end state is predicted by the sign of the spreading coefficient ($S = \Sigma^F - \Sigma^D - \Sigma^{DF}$) which relates the surface tension of the three interfaces: fluid/air (Σ^F), drop/air (Σ^D), and drop/fluid (Σ^{DF}). We experimentally investigate this behavior but discover that a static lens may form even when the spreading coefficient predicts complete spreading. We measure the surface tension of the underlying fluid and deduce that fluid escapes the contact line of the drop. If we allow the surface tension of the subphase to change due to this escaping fluid, we find the resulting spreading coefficient predicts a static lens. We compare the results to a mathematical model and confirm the observed spread area. The results of this investigation suggest that the lens resists flowing over the escaped layer of the same fluid, the mechanism of autophobing.

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