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Curvature Capillary Repulsion

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In prior work, we have studied capillary curvature attraction: a microparticle on a curved fluid interface interacts with the curvature field in a manner akin to a charged quadrupole in an applied external electrostatic field. Particles rotate to a preferred orientation, and migrate to minimize the excess area that they make in the interface. On curved interfaces formed around a micropost, particles migrate along principal axes to sites of high curvature, typically until they make contact with the micropost. Here we report capillary curvature repulsion, in which particles migrate to equilibrium sites far from contact with the micropost. Using theory and experiment, we explore the dependence of these interactions to particle and post geometry. Since fluid interfaces can be actively controlled, this work provides guidance on the formation of reconfigurable structures. We report preliminary work on active control of colloid assembly in this context.