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Colloidal Deposition of Ellipsoidal Particles: Competition between Capillary and Hydrodynamic Forces DONG-OOK KIM, MIN PACK, Drexel University, HYOUNGSOO KIM, Princeton University, YING SUN, Drexel University — Ellipsoidal particles have previously been shown to suppress the coffee-ring effect in millimeter-size colloidal droplets. Compared to their spherical counterparts, ellipsoidal particles experience stronger adsorption energy to the drop surface where the anisotropy-induced liquid-air interface deformation leads to much greater capillary attractions between particles. Using inkjet-printed colloidal drops of varying drop size, particle concentration, and particle aspect ratio, the present work demonstrates how the suppression of the coffee-ring is not only a function of the particle anisotropy, but rather a competition between the propensity for particles to assemble at the drop surface via capillary interactions and the evaporation-driven particle motion to the contact line. For ellipsoidal particles on the drop surface, the capillary force increases with particle concentration and aspect ratio, while the hydrodynamic force increases with aspect ratio but decreases with drop size. When the capillary force dominates, the surface ellipsoids form a coherent network inhibiting advection and the coffee-ring effect is suppressed, whereas when the hydrodynamic force dominates, the ellipsoids move to the contact line resulting in coffee-ring deposition.

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