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Adsorption dynamics of colloidal ellipsoids at oil-water interfaces

ANNA WANG, W. BENJAMIN ROGERS, VINOTHAN N. MANOHARAN, Harvard University — Nonspherical particles at immiscible fluid interfaces have strong interactions with each other and with the curvature of the host interface. However, the dynamics of nonspherical colloidal particles attaching to an interface have not yet been studied. We use digital holographic microscopy to image micron-sized polystyrene ellipsoids breaching an oil-water interface at hundreds of frames per second. We show that the particle height and polar angle have large fluctuations, but both change approximately logarithmic with time, likely due to contact line pinning on the surface of the particle. Equilibrium is reached on a timescale at least three orders of magnitude slower than that expected from Langevin dynamics simulations [1]. We also find that all the trajectories collapse into straight lines when we plot particle polar angle as a function of particle height, unlike the trajectories seen in simulation [1,2]. The differences between experiment and simulation suggest that contact line pinning and the shape of the three phase contact line may strongly influence the dynamics of particle adsorption. [1] The Journal of Chemical Physics 132 (16), 164902, (2010) [2] Soft Matter 10, 4977-4989 (2014)

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