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Sedimentation of a sphere through a liquid-liquid interface LUUK ALTENBURG, DIOGO BARROS, ELLEN LONGMIRE, University of Minnesota — The penetration of a falling solid sphere through the interface of two immiscible fluids is examined experimentally. Depending on the solid-liquid density ratio and the Bond number, the sphere may either float or sink, entraining and trapping a volume of light silicone oil into the heavier aqueous solution. To investigate in detail the floating/sinking transition, the motion of printed spheres with controlled density is quantified using high-speed imaging and the results are compared to existing models in the literature. The parameter space includes the Bond number (computed using the liquid-liquid density difference and the sphere radius) in the range of 0.2 to 1.05 and fluid-fluid viscosity ratios of 0.05-15. The ratio of solid-oil to water-oil density difference is within the range 1.6-21. The influence of inertia in the problem is also considered by releasing spheres from multiple heights to account for a variable approach Reynolds number of up to 174. Finally, the impact of irregularities in surface geometry on the floating/sinking dynamics will be presented.

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