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Shear Induced Rupturing of Nanoemulsion Droplets in Dilute and Concentrated Surfactant Solutions S. GRAVES, K. MELESON, T.G. MASON, Department of Chemistry and Biochemistry, University of California- Los Angeles — We use high-pressure microfluidic injection to rupture silicone oil-in-water droplets repeatedly down to diameters below 100 nm, thereby creating "nanoemulsions." These droplets are stabilized against coalescence by the surfactant sodium dodecyl sulfate (SDS). We systematically increase the SDS concentration, C, from 8 to 1000 mM, and we find a decrease in the droplet radius that follows a power law form:$\langle a_s(C)\rangle \sim C^{-\alpha}$, where α= 1/3, over several decades in C down to an average radius of $\langle a_s\rangle = 18$ nm. The larger droplet radius at small C may be due to reduced coverage of the deformed droplet surfaces by the surfactant, thereby facilitating shear-induced coalescence. Our observed decrease in the droplet radius deviates from the classical prediction that the radius is inversely proportional to the viscosity of the continuous phase.

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