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Volume Fraction Dependence of Droplet Rupturing in Concentrated Nanoemulsions K. MELESON, S. GRAVES, T.G. MASON, Department of Chemistry and Biochemistry, University of California- Los Angeles — We investigate droplet rupturing by extreme shear in concentrated silicone oil-in-water nanoemulsions stabilized by sodium dodecyl sulfate (SDS) surfactant. According to Taylor's prediction for dilute emulsions, the ruptured droplet radius, a, varies inversely with the viscosity of the continuous phase. If one assumes that the emulsion's effective viscosity controls the average radius of the ruptured droplets, then emulsions that have larger droplet volume fractions, ϕs would be ruptured by the same shear flow to smaller radii. In stark contrast to this, we find that the average droplet radius actually rises with as ϕ approaches the quiescent maximally random jammed value of 0.64. This is evidence that both droplet rupturing and coalescence occur when concentrated emulsions are subjected to extreme shear. We have also observed phase inversion to an oil-continuous emulsion for $\phi > 0.64$. This supports the idea that coalescence occurs as the driving shear breaks thin films between the concentrated oil droplets at high ϕ. In addition, we find that the ruptured droplet size is relatively insensitive to large changes in the oil viscosity inside the droplets.

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