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Structure and Rheology of Concentrated Emulsions¹ JUNG-REN HUANG, YI-CIAN LAI, CHE-HAO OU, Physics Department, National Taiwan Normal University, JIH-CHIANG TSAI, Institute of Physics, Academia Sinica — We construct a shearing apparatus combining light scattering and stress measurement to study the structure and rheology of concentrated monodisperse emulsions. The emulsions are subjected to oscillatory shear of variable amplitude and frequency. The light scattering data reflect droplet deformation as well as shear history-dependent inter-droplet structures. The stress measurements display pseudoplasticity near zero shear rate and shear-thinning behavior at finite shear rates. In addition, the time-resolved, synchronous measurement of light scattering and rheology reveal detailed information about the complex structure-rheology relationship of emulsions. Shear disorders the droplets at low and high shear rates but induces order at medium shear rates. Furthermore, the effective viscosity increases as the degree of inter-droplet order decreases.

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