Aggregation of Slippery Droplets in Attractive Nanoemulsions

Using time-resolved small angle neutron scattering (TR-SANS), we have measured the wavenumber-dependent structure factor, $S(q)$, of monodisperse nanoemulsions that aggregate and gel after we suddenly turn on a strong, short-range, slippery attraction between the droplets. At high $q$, peaks in $S(q)$ appear as dense clusters of droplets form, and $S(q)$ increases strongly toward low $q$, as these dense clusters become locked into a rigid gel network, despite the fluidity of the films between the droplets. The long-time high-$q$ structure of nanoemulsion gels formed by slippery diffusion limited cluster aggregation is universal in shape and remarkably independent of the droplet volume fraction.