Size Limit for Particle-Stabilized Emulsion Droplets under Gravity

We demonstrate that emulsion droplets stabilized by interfacial particles become unstable beyond a size threshold set by gravity. This holds not only for colloids but also for supracolloidal glass beads, using which we directly observe the ejection of particles near the droplet base. The number of particles acting together in these ejection events decreases with time until a stable acornlike configuration is reached. Stability occurs when the weight of all remaining particles is less than the interfacial binding force of one particle. We also show the importance of the curvature of the droplet surface in promoting particle ejection.

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