

The Establishment of a Preparation of Stable Emulsion under Surfactant-free Condition and Explication of flocculation/coalescence processes

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We have investigated surfactant-free O/W emulsions (SFEs), which can be prepared without addition of surfactant with ultrasonicator at extremely low oil concentrations (~0.1 vol%) slightly above oil solubility. SFE is relatively unstable compared with ordinary emulsion stabilized by surfactant, however, it keep dispersion for a certain time under surfactant-free condition. For example, when droplet size was observed by dynamic light scattering (DLS) measurement for benzene SFE, droplet size distribution changed from ~30 nm (S class), to ~300 nm (M class) and to ~3000 nm (L class) with lapse of time during one or two hours, while for n-hexadecane SFE, droplet size around 50 nm in diameter grew up to 200 nm during 3 days. Summarizing the droplet sizes of several kinds of hydrocarbon SFEs observed by DLS, SFE consisting of hydrocarbon with longer chain length was more stable than shorter one. Furthermore, we found that hydrocarbon having longer chain length and branch like glyceroltrioreto makes significantly stable emulsion under absence of surfactant. Larger molecules is able to form rigid surface of droplet and prevent molecular diffusion from droplet surface.