

Supporting Information

CO₂-controlled reactors: epoxidation in emulsions with droplet size from micron to nanometer scale

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10 **The ¹H NMR spectra:** The ¹H NMR spectrum of a typical upper oil phase sample is shown in Fig. S1a. The chemical shifts of 6.60, 5.65, 5.15 ppm represent the H atoms of styrene, and the peaks of 3.75, 3.03, 2.65 ppm are the H atoms of styrene oxide. The specified chemical shift of surfactant, CTAB, at 3.48 ppm (Fig. S1b) was not observed in the ¹H NMR spectrum of the upper oil phase, indicating that the surfactant was not soluble in the upper oil phase.

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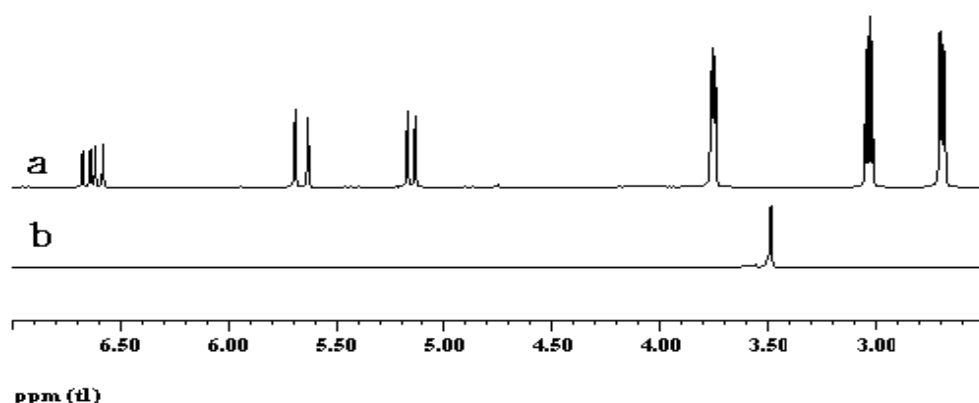


Fig. S1 (a) the ¹H NMR spectrum of the upper oil phase of the reaction system after the reaction and phase separation (the reaction condition was the same as that in Fig. 2); (b) the ¹H NMR spectrum of CTAB with a concentration of 0.055 M.

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SAXS Data Analysis: Fig. S2 presents typical scattering pattern and distance distribution function of the H₂O/CTAB/heptane/H₂O₂/styrene/CO₂ nanoemulsion with CTAB concentration of 0.055 M using Igor Pro. It indicates that globular droplets are formed because of the bell-shaped of $p(r)$ function. Pair distance distribution functions of the H₂O/CTAB/heptane/H₂O₂/styrene/CO₂ nanoemulsions with different CTAB concentrations are 25 shown in Fig. S3.

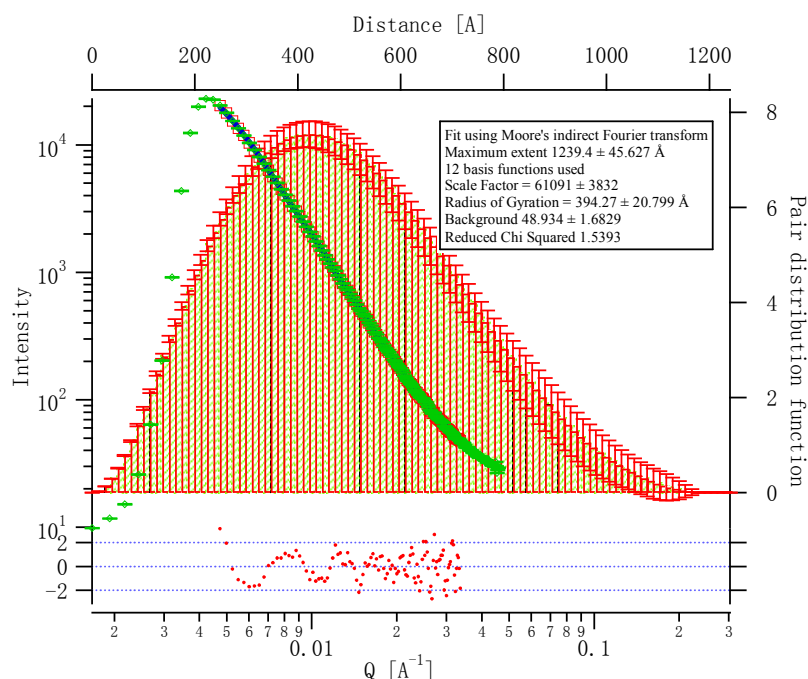


Fig. S2 Scattering intensity and distance distribution function of the H₂O/CTAB/heptane/H₂O₂/styrene/CO₂ nanoemulsions ($V_{\text{heptane}}/V_{\text{water}} = 4:5$, $V_{\text{total}} = 6$ mL, 4.5 M H₂O₂, 1.5 M styrene, 0.3 M KOH) with CTAB 5 concentration of 0.055M at 40.0 °C and 5.27 MPa.

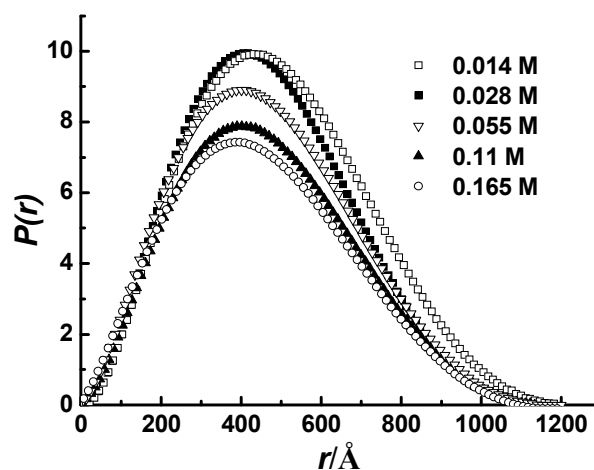


Fig. S3 Pair distance distribution function of the H₂O/CTAB/heptane/H₂O₂/styrene/CO₂ nanoemulsions ($V_{\text{heptane}}/V_{\text{water}} = 4:5$, $V_{\text{total}} = 6$ mL, 4.5 M H₂O₂, 1.5 M styrene, 0.3 M KOH) with different CTAB concentrations at 40.0 °C and corresponding P_T .

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Nanoemulsion formation with different styrene concentrations: Fig. S4 shows the P_T values of the nanoemulsions with different styrene concentrations. Evidently, the P_T values increased with increasing styrene concentration.

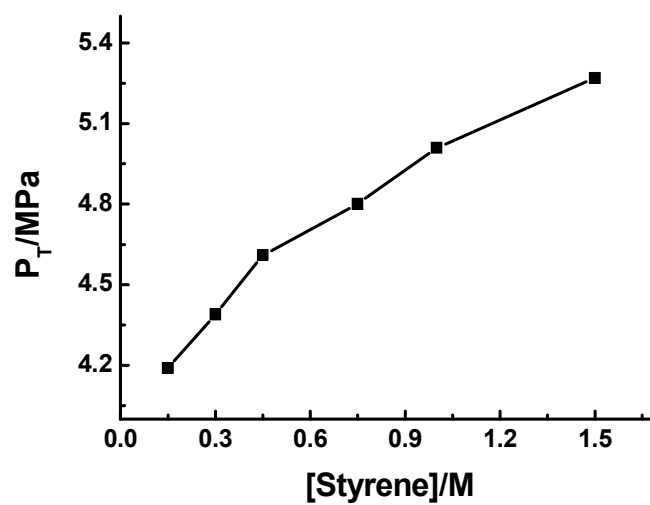


Fig. S4 Dependence of P_T on styrene concentration in the $H_2O/CTAB/heptane/H_2O_2/styrene/CO_2$ nanoemulsions ($V_{heptane}/V_{water} = 4:5$, $V_{total} = 6$ mL, 0.055 M CTAB, 4.5 M H_2O_2 , 0.3 M KOH).