Supporting information

Stabilization of carbon dioxide (CO_2) bubbles in micrometer-diameter aqueous droplets and the formation of hollow microparticles

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Table S1. Calculation of the amount of CO_2 dissolved in aqueous drops with 2.5 wt% SDS.

Parameters	**Onset of generation**	**End of microfluidic channel**	**Collected outside the microfluidic channel**
Volume of the aqueous drops ($V_{aqueous}$, liter)*	3.49E-8		
Diameter of bubble (d) (μm)	416	265	153
Theoretically calculated the amount of CO_2 dissolved in aqueous drops based on Henry's Law (K_H= 3.2 ×10^{-4} mol L^{-1} kPa^{-1}, P_{CO2}=8.96kPa) $\mathbf{N_{CO2\text{-}drop}}$ (mol)	1.00E-10		
Experimentally observed the amount of CO_2 decreased in aqueous drops (density of CO2 at 8.96kPa is 0.159 g/l) $\mathbf{N_{CO2\text{-}bubble}}$ (mol)	1.29E-10		
	$\mathbf{N_{CO2\text{-}bubble} > N_{CO2\text{-}drop}}$		

* Due to the irregular shape of the drops when they were generated in microfluidic channels, the volume of the drops was calculated based on the diameter of drops collected outside the channel.

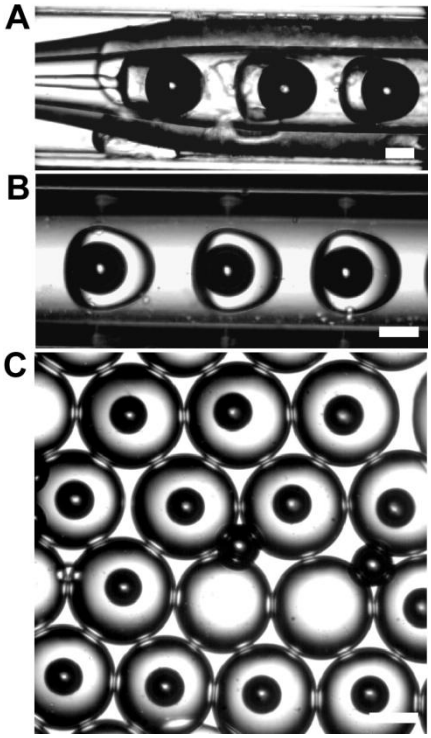

Fig. S1 Microscopic images of the CO_2-in-water-in-oil drops when they were (A) generated at the orifice of the microfluidic device, and (B) flowing near the end of microfluidic device, and (C) collected outside the device. Note the change of the size of bubbles. The aqueous phase contains 2.5 wt% SDS and the PDMS oil phase contains 2 wt% 749. Scale bar: 200 μm.

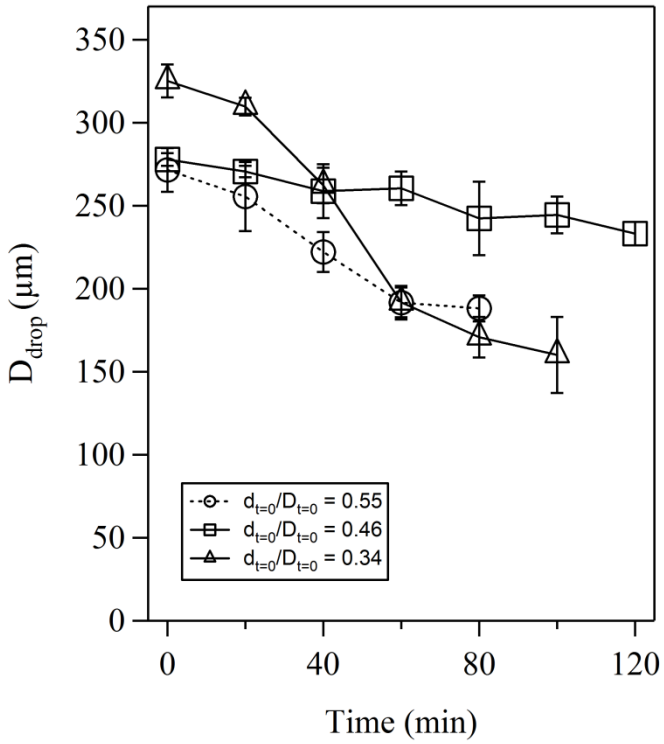

Fig. S2 Change of the size of CO_2-in-water-in-oil drops with evaporation time at different initial bubble-to-drop diameter ratios. The aqueous phase contains 2.5 wt% SDS and the PDMS oil phase contains 2 wt% 749.

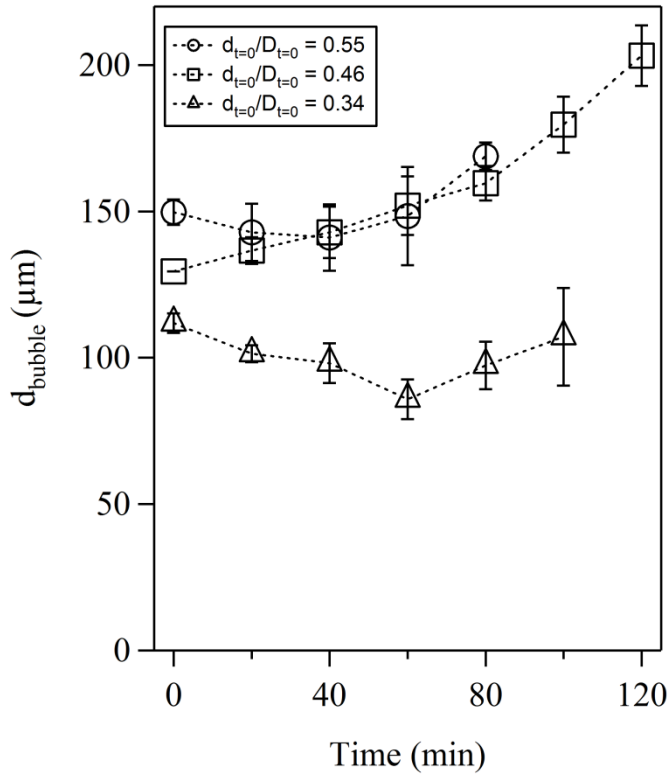

Fig. S3 Change of the size of CO_2 bubbles encapsulated in aqueous drops with evaporation time at different initial bubble-to-drop diameter ratios. The aqueous phase contains 2.5 wt% SDS and the PDMS oil phase contains 2 wt% 749.

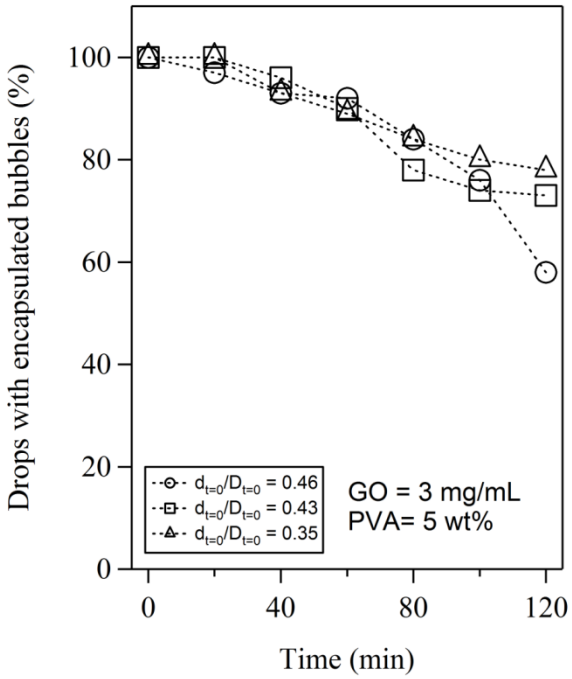

Fig. S4 Change of percentages of CO_2-containing drops with evaporation time in the presence of 3 mg/mL GO. The aqueous phase contains 1 wt% SDS and 5 wt% PVA, and the PDMS oil phase contains 2 wt% 749.

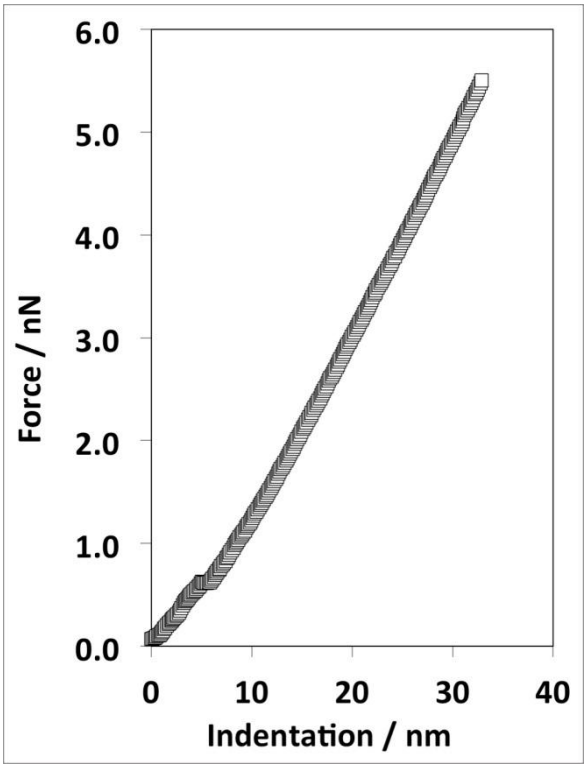

Fig. S5 A typical force-distance curve of the hollow particles shown in Figure 3.