

Supplementary Information

Experimental results of the USB-driven unit

The flow rate of the fluids depends on the gas production rate of the electrolysis, which is controlled by the voltage applied on the electrodes in the pressure chamber. The relationship between the flow rate of the continuous phase and the supply voltage was obtained by measuring the volume of the collected liquid every ten seconds in the experiments, as shown in Fig. A. It is found in Fig. A(a) that the flow rate did not have a linear relationship to the supply voltage. And even at a fixed supply voltage, the flow rate was not stable with time, as shown in Fig. A(b). One of the reasons for the instability of the flow rate is the dissolving of the electrodes in the electrolysis reaction. The flow rate decreased rapidly when the electrodes were found to be dissolved after 10-minute experiment. However, the resultant flow due to the electrolysis is stable enough to generate emulsion droplet for at least ten minutes before the electrodes are degraded. Therefore, this electrolysis method can still be used to generate emulsion droplets in the application without the requirements for long duration.

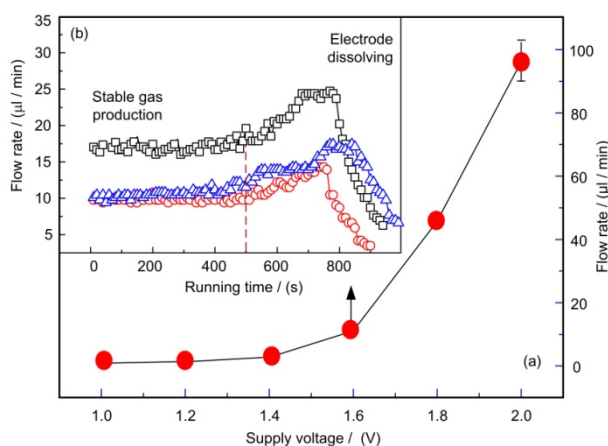


Fig. A. Relationship between the flow rate of the continuous phase and the applied voltages. (a) The flow rate of the water phase in the flow focusing channels changed with the supply voltages. The symbols represent the mean value of the flow rates of the water phase flowing in three different devices in 5 minutes. (b) The flow rate stability of the continuous phase changing with time under the voltage of 1.6 V.