Microfluidic method for generating monodisperse multiple emulsion using hydrodynamic flow control

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This study presents the microfluidic approach for preparing monodisperse multiple emulsions using hydrodynamic control. To generate of multiple emulsions, we fabricate a noble microfluidic capillary device based on co-flowing stream without any surface modification. Based on the system, we can successfully generate multiple emulsions (W/O/W) using water containing 0.5 wt% Tween 20, n-hexadecane with 5 wt% Span 80, and 10 wt% poly(vinyl alcohol)(PVA) aqueous solution, respectively. Furthermore, we control the number of inner droplets by modulation of flow rate of inner fluid at fixed flow rate of middle and outer fluid. The multiple emulsions having precisely controlled inner droplets can be applicable for multiple chemical reactions as an isolated microreactor.