Microfluidic preparation of monodisperse multiple emulsion using hydrodynamic control

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This study reports the microfluidic preparation of monodisperse multiple emulsions using hydrodynamic control. To generate multiple emulsions, we fabricate a microfluidic capillary device based on co-flowing stream without any surface modification of microchannels. 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 size and number can be applicable for multiple chemical reactions as an isolated microreactor.