(Supporting Information)

Controllable microfluidic fabrication of Janus and microcapsule particles for drug delivery application

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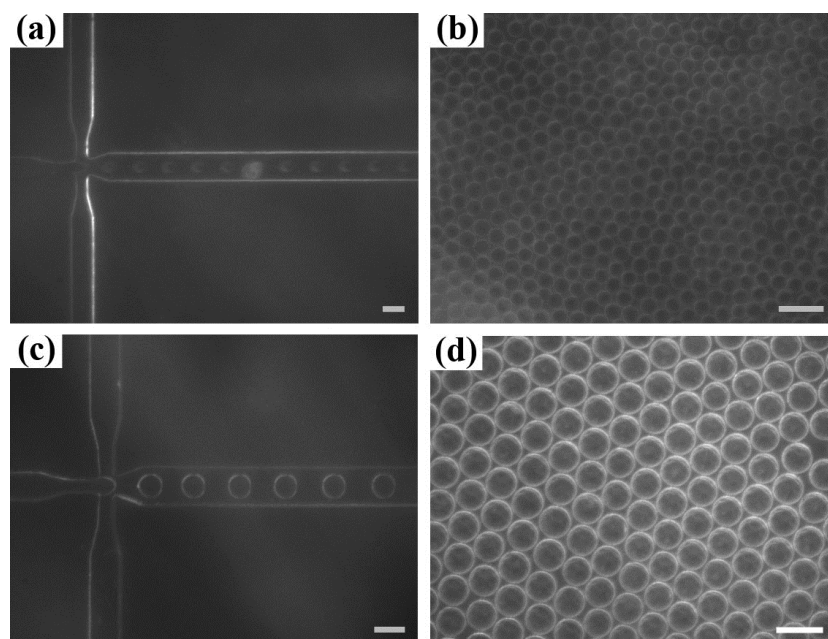**(1) Stable generation of droplets in microchannels**

Figure S1. Optical images showing (a, c) generation of droplets in the flowing focusing region and (b, d) monodisperse droplets collected at the outlet of microfluidic devices. The solvent used in a and b is dimethyl carbonate, whilst the solvent used in c and d is dichloromethane. All the scale bars are 200 μm.

(2) Schematic illustration of droplet-based microfluidic device
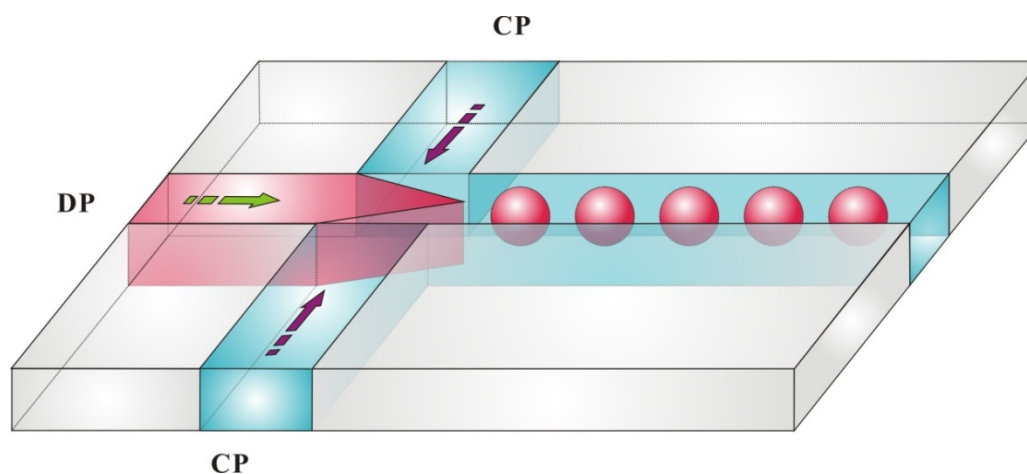

Figure S2. Schematic illustration of the microfluidic device used for synthesis of Janus and microcapsule particles. Fabrication and operation procedure is described in detail in experimental section. CP: continuous phase, DP: dispersed phase.

(3) Fabrication of PLGA/PCL particles using a mixture solvent containing dimethyl carbonate and dichloromethane
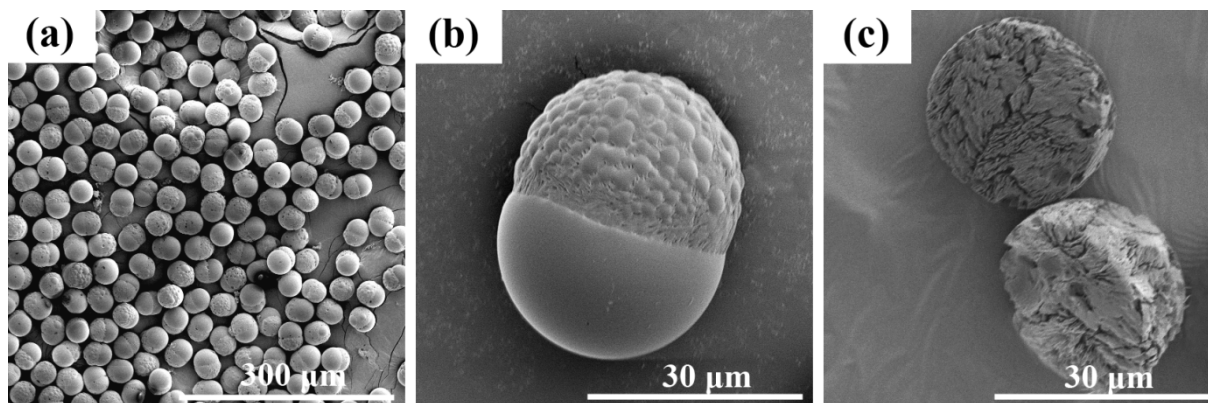
Figure S3. SEM images of PLGA/PCL microparticles prepared using the mixture of dimethyl carbonate and dichloromethane (5:1, v/v) as solvent for the dispersed phase. (a, b) microparticle without acetone treatment; (c) microparticle after treated with acetone.

(4) Calculation of interfacial tension between PLGA and PCL in dimethyl carbonate system

PLGA and PCL solutions were first spin-coated on clean glass slides to form a uniform film after solvent evaporation. Then, two standard probe liquids (pure water and diiodomethane) with well-known surface energy (γ_L), dispersive (γ_L^d) and polar component (γ_L^p), were dropped on the surface of polymer film for contact angle measurements (OCA15, Data Physics Instruments GmbH). According to the classic Owens-Wendt-Kaelble (OWK) equation,

$$\gamma_L(1 + \cos\theta) = 2\sqrt{\gamma_S^d\gamma_L^d} + 2\sqrt{\gamma_S^p\gamma_L^p}$$

The dispersive (γ_S^d) and the polar component (γ_S^p) of PLGA and PCL could be obtained, and their surface energy were calculated as $\gamma_S = \gamma_S^d + \gamma_S^p$. The interfacial tension between PLGA and PCL is the D-value between the surface energy of PLGA and PCL. These data were summarized in Table S1.

Table S1. Calculation of interfacial tension between PLGA and PCL in dimethyl carbonate system

Entry	Water-PLGA	Diiodomethane-PLGA	Water-PCL	Diiodomethane-PCL
Contact angle (^{O})	85.5	44.5	102.7	38.8
Surface energy (mN/m)	37.28		44.76	
Interfacial tension (mN/m)	7.48			

(5) SEM images of the sliced microcapsules prepared under the mass ratio of PLGA and PCL (7:3, w/w).
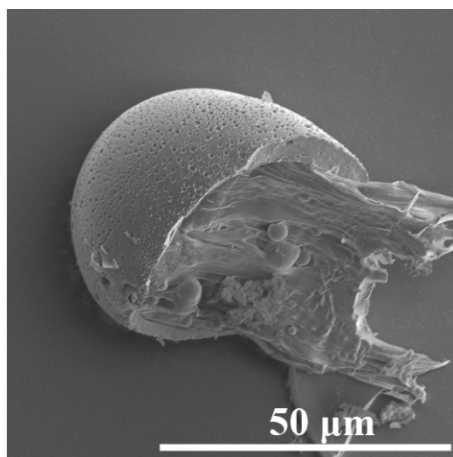

Figure S4. SEM images of the sliced microcapsules prepared under the mass ratio of PLGA and PCL (7:3, w/w).

Movie S1: Video of droplets generation for the synthesis of Janus particle in microfluidic device. The flow rates of disperse phase and continuous phase were 0.4 and 1.6 mL/h, respectively.

Movie S2: Video of droplets generation for the synthesis of microcapsule particle in microfluidic device. The flow rates of disperse phase and continuous phase were 0.25 and 0.45 mL/h, respectively.