Electronic Supplementary Information

1. Microfluidic chips

The six microfluidic chips used in the experiments are shown schematically in Fig. S1. The height of the microchannels is uniformly 100 μm. Details of each chip are listed in Table S1 and S2.

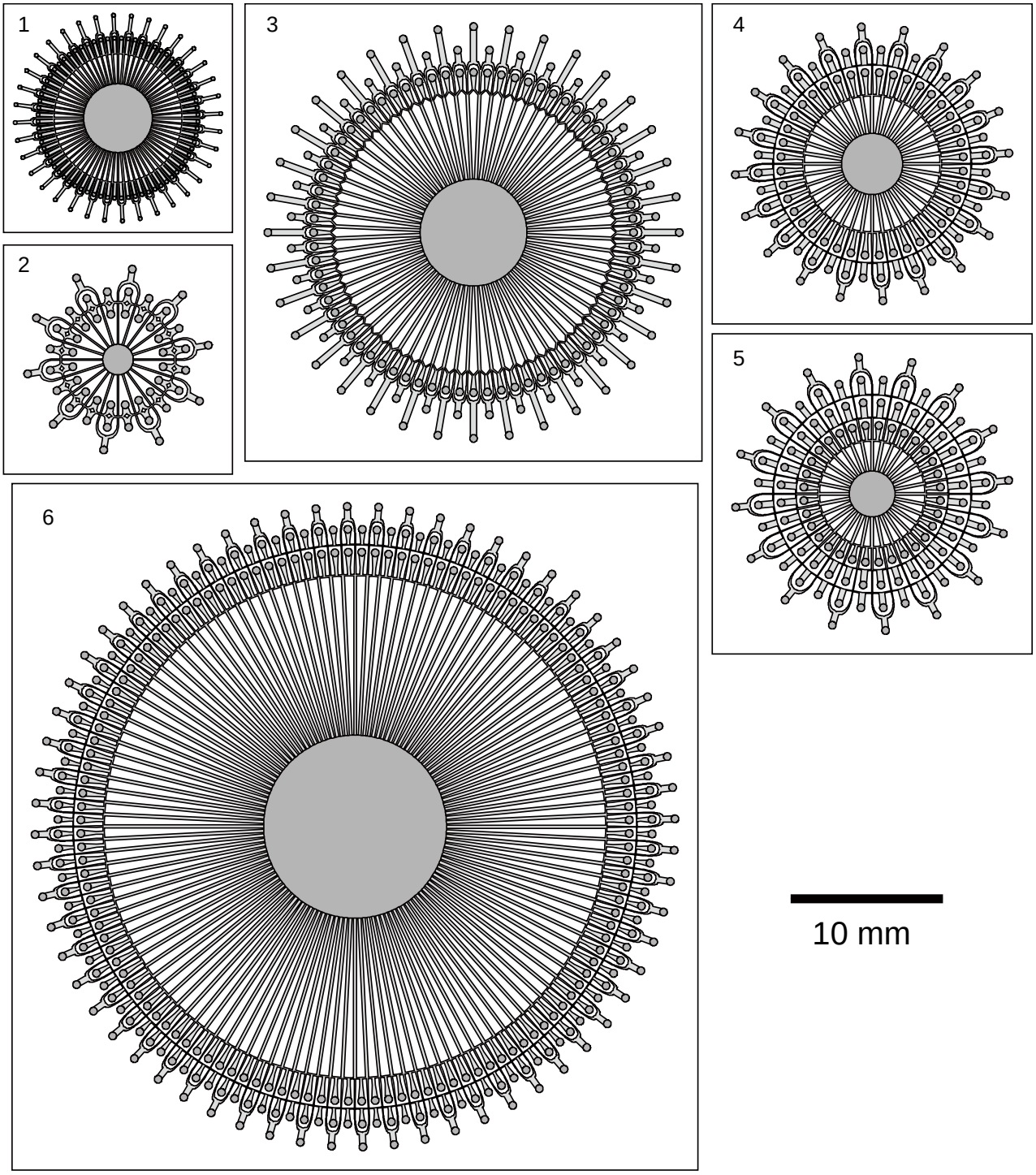

Figure S1. Schematic illustrations of the six microfluidic chips used.

Table S1. Detailed information on the microfluidic chips.

	Chip size (mm^2)	Size of input holes (μm)	Number of input holes	Number of infused fluids	Type of emulsions	Number of final droplet generators	Related figures in the text
1	15 × 15	250	108	2	single	144	Fig. 1, 5
2	15 × 15	500	50	3	Janus	40	Fig. 7
3	30 × 30	500	144	3	Janus	72	Figs.1, 6
4	21 × 21	500	100	3	double	40	Fig. 8
5	21 × 21	500	112	4	triple	32	Figs. 1,9
6	45 × 45	500	320	3	double	128	Fig. 8

Table S2. Widths of microchannels around junctions.

#	Innermost junctions		Middle junctions		Outermost junctions	
	Output (μm)	Input (μm)	Output (μm)	Input (μm)	Output (μm)	Input (μm)
1	100	100	-	-	-	-
2	100	100	-	-	-	-
3	200	100	-	-	-	-
4	200	100	100	50	-	-
5	200	100	100	50	50	50
6	200	100	100	50	-	-

2. Supporting modules with annular channels

Details of supporting modules with annular channels are listed in Table S3.

Table S3. Supporting modules with annular channels

#	Chip #	Module size (mm^3)	Number of annulus	1st annulus (outer)		2nd annulus		3rd annulus		4th annulus (inner)	
				i.d. (mm)	o.d. (mm)	i.d. (mm)	o.d. (mm)	i.d. (mm)	o.d. (mm)	i.d. (mm)	o.d. (mm)
1	1	36 × 36× 24	2	13	14	10	11	-	-	-	-
2	2	36 × 36× 32	3	11.5	12.5	8.5	9.5	5.5	6.5	-	-
3	3	48 × 48× 32	3	26.5	27.5	23.5	24.5	20.5	21.5	-	-
4	4	40 × 40× 32	3	17.5	18.5	14.5	15.5	11.5	12.5	-	-
5	5	40 × 40× 40	4							8.5	9.5
6	6	64 × 64× 32	3	41.5	42.5	38.5	39.5	35.5	36.5	-	-

3. Production rates

Table S4 lists the production rates demonstrated in this study. These flow rates were not the maximized flow rates in the microfluidic modules we used.

Table S4. Production rates demonstrated in this study.

Chip#	Type of emulsions	Number of final droplet generators	Production rate	Related figures in the text
1	single	144	180 mL h^{-1}	Fig. 1, 5
2	Janus (immiscible)	40	20 mL h^{-1} (10+10)	Fig. 7
3	Janus (miscible)	72	72 mL h^{-1} (36+36)	Fig. 6
4	double	40	25 mL h^{-1} (5+20, two-step) 20 mL h^{-1} (10+10, one-step)	Figs. 8b-g Fig. 8h
5	triple	32	31 mL h^{-1} (5+6+20, three-step)	Fig. 9
6	double	128	75 mLh^{-1} (15+60, two-step)	Fig. 8i

Supplemental Movie Captions:

1_cross144.mpg: Movie clip of the formation of O/W emulsion droplets in the module having 144 cross-flowing MFDGs, recorded at 6000 fps. Disperse phase flow rate (Q_d) was 180.0 mL h^{-1} and continuous phase flow rate (Q_c) was 270.0 mL h^{-1}.

2_sheath72-Janus.mpg: Movie clip of the formation of Janus droplets of two miscible segments in the module having 72 ψ-shaped MFDGs, recorded at 4000 fps. Flow rates were Q_d = 72.0 mL h^{-1}(36.0 mL h^{-1} × 2) and Q_c = 576 mL h^{-1}.

3_cross40-Janus.mpg: Movie clip of the formation of Janus droplets in the module having 40 cross-flowing MFDGs, recorded at 3000 fps. Flow rates were Q_d = 20.0 mL h^{-1}(10.0 mL h^{-1} × 2) and Q_c = 40.0 mL h^{-1}.

4_40-double-twostep-single.mpg: Movie clip of the two-step formation of single core O/O/W double emulsion droplets in the module having 40 sets of two-consecutive cross-shaped MFDGs, recorded at 3000 fps. Flow rates were Q_d = 25.0 mL h^{-1}(core 5.0 mL h^{-1} + shell 20.0 mL h^{-1}) and Q_c = 500.0 mL h^{-1}.

5_40-double-twostep-dual.mpg: Movie clip of the two-step formation of dual core O/O/W double emulsion droplets in the module having 40 sets of two-consecutive cross-shaped MFDGs, recorded at 3000 fps. Flow rates were Q_d = 25.0 mL h^{-1}(core 5.0 mL h^{-1} + shell 20.0 mL h^{-1}) and Q_c = 250.0 mL h^{-1}.

6_40-double-onestep.mpg: Movie clip of the one-step formation of single core O/O/W double emulsion droplets in the module having 40 sets of two-consecutive cross-shaped MFDGs, recorded at 1000 fps. Flow rates were Q_d = 20.0 mL h^{-1}(core 10.0 mL h^{-1} + shell 10.0 mL h^{-1}) and Q_c = 150.0 mL h^{-1}.

7_128-double-twostep.mpg: Movie clip of the two-step formation of O/O/W double emulsion droplets in the module having 128 sets of two-consecutive cross-shaped MFDGs, recorded at 2000 fps. Flow rates were Q_d = 75.0 mL h^{-1}(core 15.0 mL h^{-1} + shell 60.0 mL h^{-1}) and Q_c = 600.0 mL h^{-1}.

All movies are prepared in MPEG-1 format.