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Supporting Information

Room-Temperature Fabrication of Mono-dispersed Liquid Crystalline Shells with High Viscosity and High Melting Point

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Instrumentation and Materials

Bright-field optical microscope equipped with CMOS camera (Point Grey, FL3-U3-13S2C-CS) was used to observe the generation processes of microcapsules. Polarizing optical microscope (Olympus BX51) with a hot stage (Japan High Tech, 10083) was used to observe the fabricated microcapsules. Poly(vinyl alcohol) (PVA; MW: 13 000–23 000 g/mol, 87–89% hydrolyzed, Sigma-Aldrich), acetone (Wako Pure Chemical Industries Ltd.) and tetrahydrofuran (THF, Wako Pure Chemical Industries Ltd.) and 4-cyano-4'-octylbiphenyl (8CB, Tokyo Chemical Industry Co., Ltd.) were purchased. 4-cyano-4'-octyloxybiphenyl (8OCB) was synthesized with 1-iodeoctane (Tokyo Chemical Industry Co., Ltd.) and 4-cyano-4'-hydroxybiphenyl (Tokyo Chemical Industry Co., Ltd.) as a precursor according to the previously reported procedure.[1] Unless otherwise noted, solvents and reagents were reagent grade and used without further purification.

Preparation of mono-dispersed microcapsules

Microcapsules with shells consisting of 8CB or 8OCB were produced using glass microcapillary devices.[2] The glass microcapillary devices comprised two tapered cylindrical capillaries inserted in a square capillary. One cylindrical capillary which has a lager diameter orifice is treated with called SC-1 solution (30 wt% H_2O_2 aqueous solution : 28 wt% NH_3 aqueous solution : water = 1:1:5) at 90°C for overnight to render it hydrophilic. The other cylindrical capillary which has a smaller orifice is treated with CYTOP (Asahi Glass Co., Ltd) to render it hydrophobic. 8CB was added with acetone (20 wt%) and 8OCB were added with acetone (23 wt%) and THF (12 wt%) to make them fluid before they were applied to the microcapillary devices. The inner phase of 10 wt% PVA solution is injected to the hydrophobic capillary and shell phase of 8CB or 8OCB solutions is injected to the interstices between the hydrophilic capillary and square capillary. The continuous outer phase of 10 wt% PVA solution is injected through the interstices between the hydrophobic capillary and square capillary, thereby forming a counter-flow against the inner and shell phases. The flow rates of the inner, shell and outer phases were independently controlled by three syringe pumps.

Information about movies

Movie S1 Generation of 8CB microcapsules in a glass microfluidic device under a bright field microscope. The flow rates are 1.0 mL/h for the inner phase, 0.5 mL/h for the shell phase and 8.0 mL/h for the outer phase. The movie is edited to slower for visibility.

Movie S2 Generation of 8CB microcapsules in a glass microfluidic device under a polarizing

microscope. The flow rates are 1.0 mL/h for the inner phase, 0.5 mL/h for the shell phase and 8.0 mL/h for the outer phase. The movie is edited to slower for visibility.

Movie S3 Generation of 8OCB microcapsules in a glass microfluidic device under a bright field microscope. The flow rates are 1.3 mL/h for the inner phase, 1.0 mL/h for the shell phase and 12.0 mL/h for the outer phase. The movie is edited to slower for visibility.

Movie S4 Generation of 8OCB microcapsules in a glass microfluidic device under a polarizing microscope. The flow rates are 1.3 mL/h for the inner phase, 1.0 mL/h for the shell phase and 12.0 mL/h for the outer phase. The movie is edited to slower for visibility.

References

1 Z. Puterová, J. Romiszewski, J. Mieczkowski and E. Gorecka, *Tetrahedron*, 2012, **68**, 8172–8180.

2 A. S. Utada, E. Lorenceau, D. R. Link, P. D. Kaplan, H. A. Stone and D. A. Weitz, *Science*, 2005, **308**, 537–541.