Electronic Supplementary Material (ESI) for Soft Matter.

Optically induced motion of liquid crystalline droplets

Yoshiharu Dogishi [1], Yota Sakai[1], Woon Yong Sohn [1] and Kenji Katayama [1,2,*]

1 Department of Applied Chemistry, Chuo University, Tokyo 112-8551, Japan;

2 PRESTO, Japan Science and Technology Agency (JST), Saitama 332-0012, Japan

*Corresponding authors:

K. Katayama, Phone: +81-3-3817-1913, E-mail: kkata@kc.chuo-u.ac.jp

Video information

Mov S1 on-off light irradiation.wmv

This is a movie of the motion of an LC droplet during the on-off irradiation of a UV light. The diameter of the droplet was 60 μm, and the concentration of SDS was 10 wt%. The UV intensity was 89 mW/cm^2.

Mov S2a top.wmv

This is a movie of the motion of an LC droplet when a UV light was irradiated from the top side. The size of the droplet was 50 μm, and the concentration of SDS was 10 wt%. The UV intensity was 89 mW/cm^2.

Mov S2b bottom.wmv

This is a movie of the motion of an LC droplet when a UV light was irradiated from the bottom side. The size of the droplet was 50 mm, and the concentration of SDS was 10 wt%. The UV intensity was 89 mW/cm^2.

Mov S2c left.wmv

This is a movie of the motion of an LC droplet when a UV light was irradiated from the left side. The size of the droplet was 50 μm, and the concentration of SDS was 10 wt%. The UV intensity was 89 mW/cm^2.

Mov S2d right.wmv

This is a movie of the motion of an LC droplet when a UV light was irradiated from the right side. The size of the droplet was 50 μm, and the concentration of SDS was 10 wt%. The UV intensity was 89 mW/cm^2.

Mov S3 convex flow.wmv

This is a movie of the convex flow inside an LC droplet when the UV light was irradiated from the right side. The size of the droplet was 200 μm, and the concentration of SDS was 5 wt%.

Mov S4 defect motion.wmv

This is a movie of the motion of the defect position during the UV light irradiation from the top side. The size of the droplet was 40 μm, and the concentration of SDS was 5 wt%.

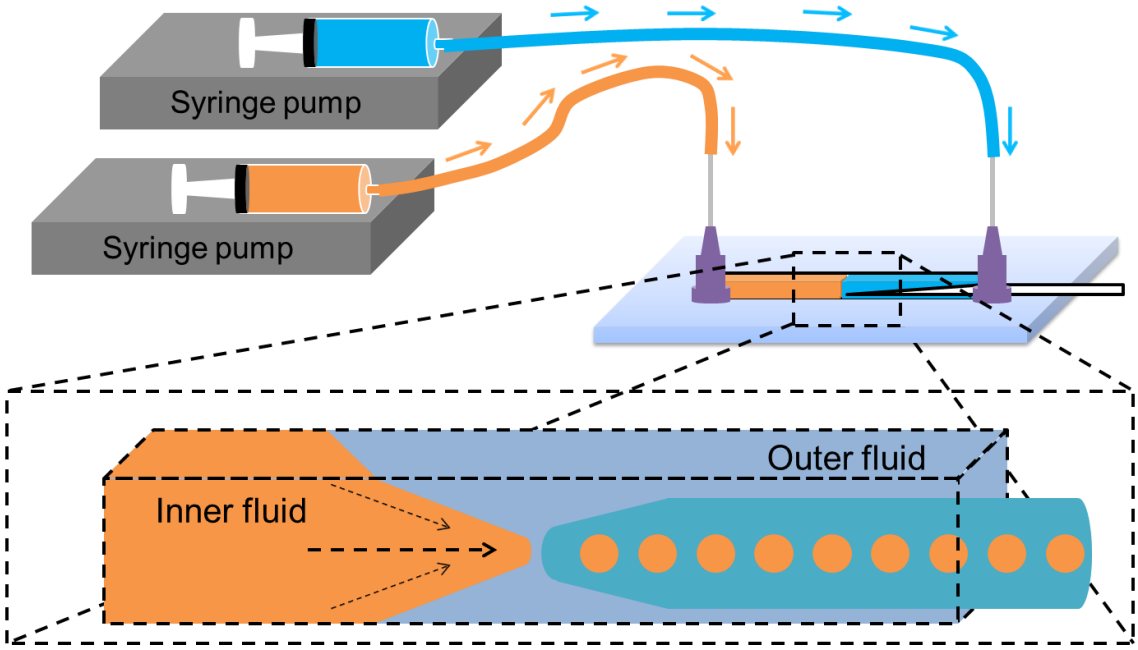
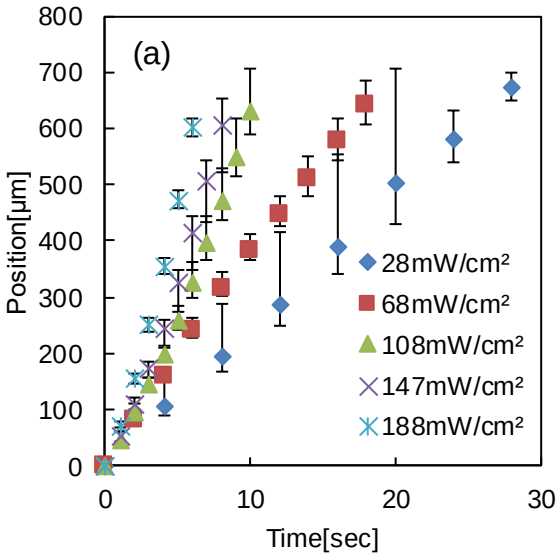


Fig.S1. The schematic diagram of the microfluidic setup consisted of a glass capillary for the formation of LC particles, and the geometry of micro-capillary and the mechanism for the formation of a single emulsion is shown. A square glass capillary (inner diameter: 0.90×0.90 mm^2) was attached on a glass slide, and a tapered cylindrical capillary was inserted (inner diameter: 0.70 mm, outer diameter: 0.87 mm) into it. The capillary was prepared by a micropipette puller (P-1000, Sutter Instrument, Novato, CA, USA) to make the tip tapered, and they were fixed by an adhesive. Syringe needles were connected to the inner and the outer fluids, and the liquids were introduced. The droplets were collected from the tapered capillary on the right side. The tip diameter of the right capillary was 50 μm. Hydrophilic treatment was applied to the capillary. For the hydrophilic treatment, plasma treatment was made by plasma cleaner (PDC-32G, Harrick Plasma, Ithaca, NY, USA). The outer fluid applied a shear force to the inner fluid and formed droplets whose size is homogeneous. Two syringe pumps were utilized to control the flow rate of the inner and outer fluids, and they were 2.0, 10.0 μL/min, respectively. A typical size of the droplets was 50 μm. The microfluidic device was operated at room temperature (25 ˚C).

53

54 Fig.S2. A microscopic image during the generation of photo-responsive LC particles is shown.



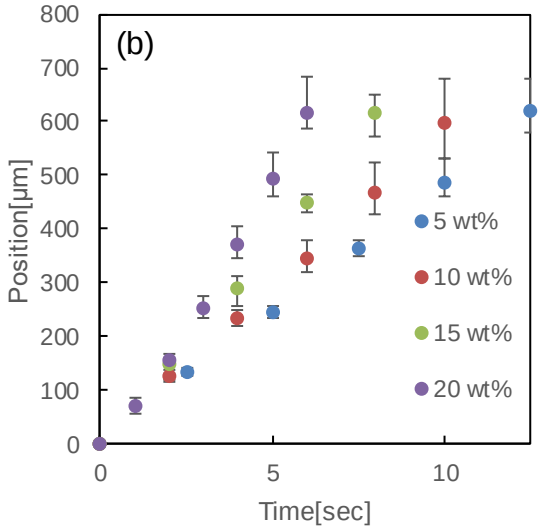


Fig.S3. The droplet tracking data for the analysis of speed is shown (a) for the UV light intensity dependence and (b) for the SDS concentration dependence. The position was analyzed from the snapshots of video data.

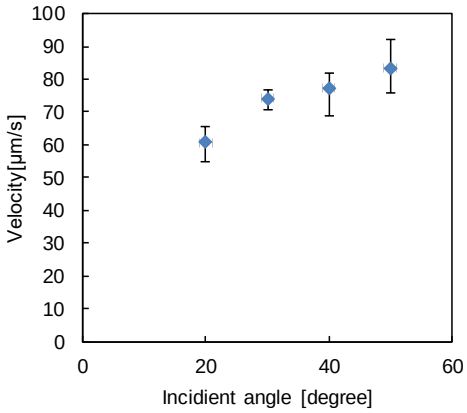


Fig.S4 The velocity dependence of MBBA droplets on the angle of incidence of the UV-LED is shown. The SDS concentration was 10 wt%, and the UV intensity was 89 mW/cm^2.

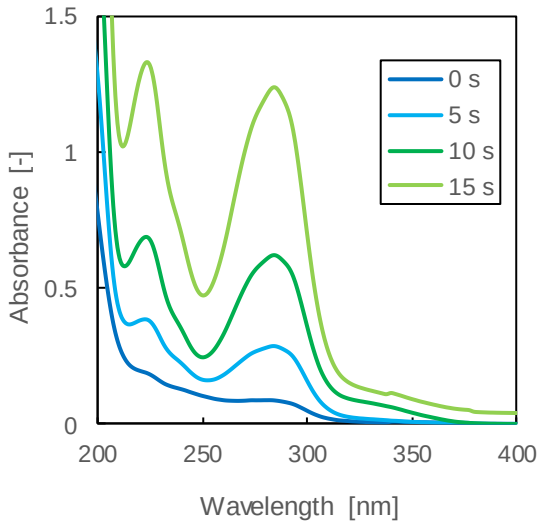


Fig.S5 The change in the absorption spectrum for an SDS solution including MBBA during the UV irradiation is shown. The sample solution was prepared by mixing an SDS solution (10 wt%, 20 mL) with a drop of MBBA (~50 μL) and emulsified. 0.5 mL of the aqueous solution was sampled every 5 seconds during the UV irradiation, and the absorption spectrum for each sample was measured. The UV light intensity was 180 mW/cm^2.