

Supporting Information

**Design Parameters and Principles of Liquid Crystal Templated Synthesis of Polymeric
Materials via Photolithography**

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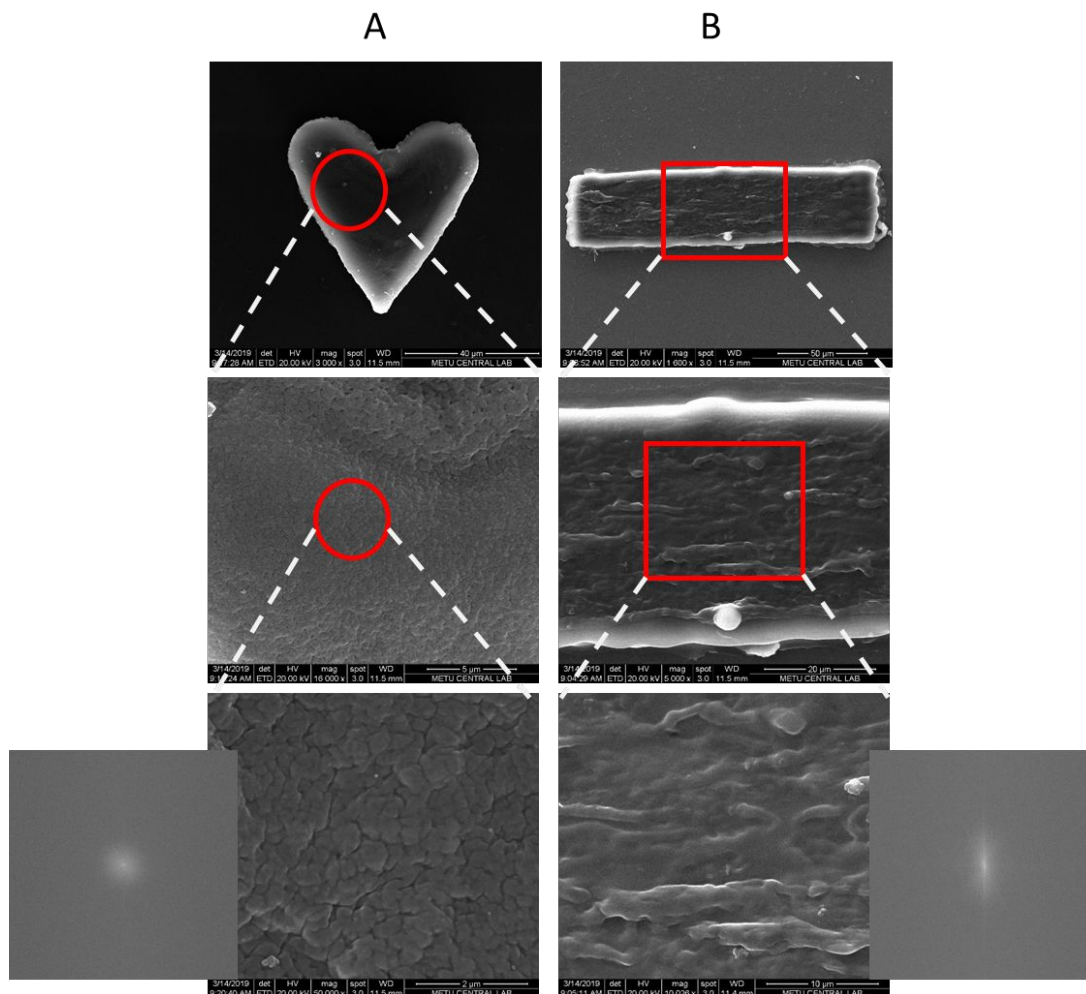


Figure S1. SEM images of microparticles synthesized from the mixture of 20% RM257 in E7 and 6 μm thickness. (A) The images of a heart shaped microparticle synthesized from a mixture maintained at homeotropic alignment between two DMOAP surfaces. (B) The images of a rectangular shaped microparticle synthesized from a mixture maintained at planar planar alignment between two rubbed PVA surfaces. The inset figures show the FFT patterns of the corresponding SEM images.

On Figure S1: The figure shows the SEM micrographs of the particles synthesized from the same mixture. However, the heart shaped particle in Figure S1A was synthesized between two DMOAP coated surfaces (for homeotropic anchoring) and the rectangular shaped particle in Figure S1B was synthesized between two rubbed PVA surfaces (for uniform planar anchoring along the long axis). The SEM images show the differences in the roughness of the surfaces. The corresponding FFT patterns indicate the anisotropy of the surface roughness of the particle synthesized between rubbed PVA surface in the direction parallel to the rubbing direction of the PVA surface.

Table S1. UV exposure times required to synthesize microparticle from mixtures of 20 wt % RM257 in E7. Collimated light source energy was adjusted to 0.7A or 1.2A. Red boxes indicates the UV exposure times used in the synthesis of the corresponding microparticles. The lengths were determined following the procedure shown in Figure S2.

Photomask Shape	ThorLabs M365LP1-C	
	0.7A	1.2A
Circle	2 seconds	<1 seconds
Triangular	3 seconds	2 seconds
Square	3 seconds	1 seconds
Rectangular	2 seconds	<1 seconds
Star	2 seconds	<1 seconds
Heart	2 seconds	<1 seconds

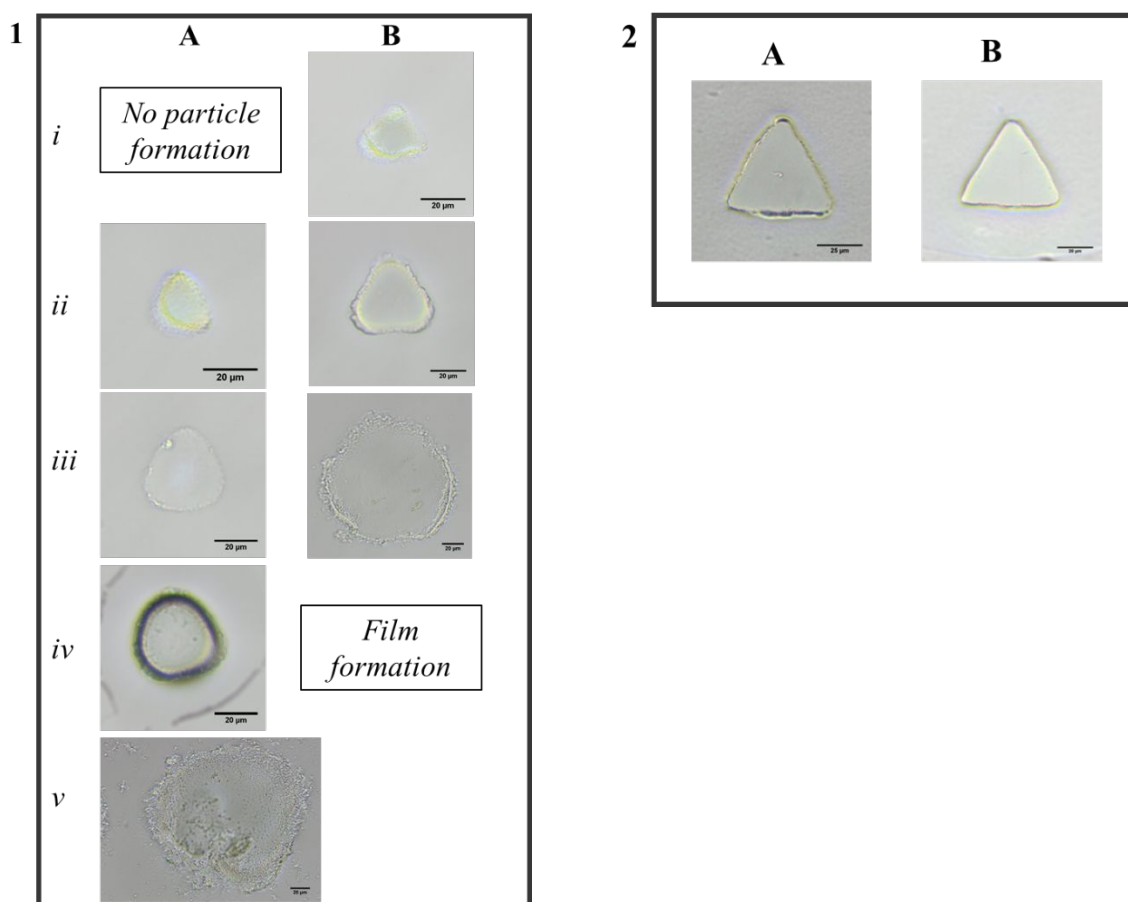


Figure S2. Features of the triangular shapes with varied current and UV exposure time. The images in column **1-A** show the polymerized regions after exposure with current setting of 0.7A whereas the images in column **1-B** show the polymerized regions after exposure with current setting of 1.2A. UV exposure times were changed from (i) 1 second, (ii) 2 seconds, (iii) 3 seconds, (iv) 4 seconds, and (v) 5 seconds. The films in column **1** were prepared between two glass surfaces with thickness of 1 mm. In the films shown in columns **2-A** and **2-B** were maintained between glass cover slides with 0.13 to 0.16 mm thicknesses. Microparticles were synthesized at 0.7A current in 3 seconds in **2-A**, whereas in **2-B** it was synthesized at 1.2A in 2 seconds.

On Figure S2: Figure S2 illustrates a demonstration of the selection of the UV light power and exposure times. The images were collected after polymerization of a film of 20 wt % RM257 in E7 with the indicated setup. As shown, we have changed the thicknesses of the glass surfaces, UV power input and the UV exposure times to find the optimum procedure for sharp edged microparticles. We found that thinner glass slides, higher power input and intermediate times, for example 0.13 mm-thick glasses, 1.2 A power input and 2 seconds for triangular shaped microparticles, were required for an acceptable precision for shaping the particles.

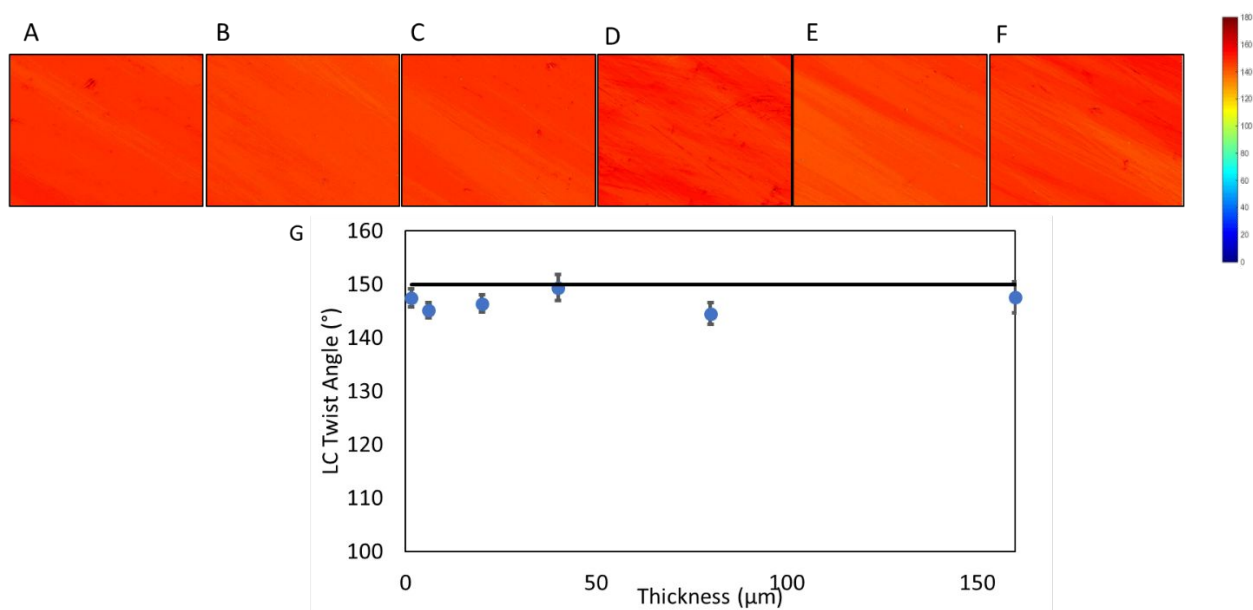


Figure S3. (A-F) The maps of the measured twist angles within a piece of a film with various thicknesses are shown. The thicknesses of the films were (A) 1.5 μm , (B) 6 μm , (C) 20 μm , (D) 40 μm , (E) 80 μm and (F) 160 μm , and a right-handed LC twist of 30° were maintained within the the films. The plot in (G) shows the average twist angle measured with respect to thickness.

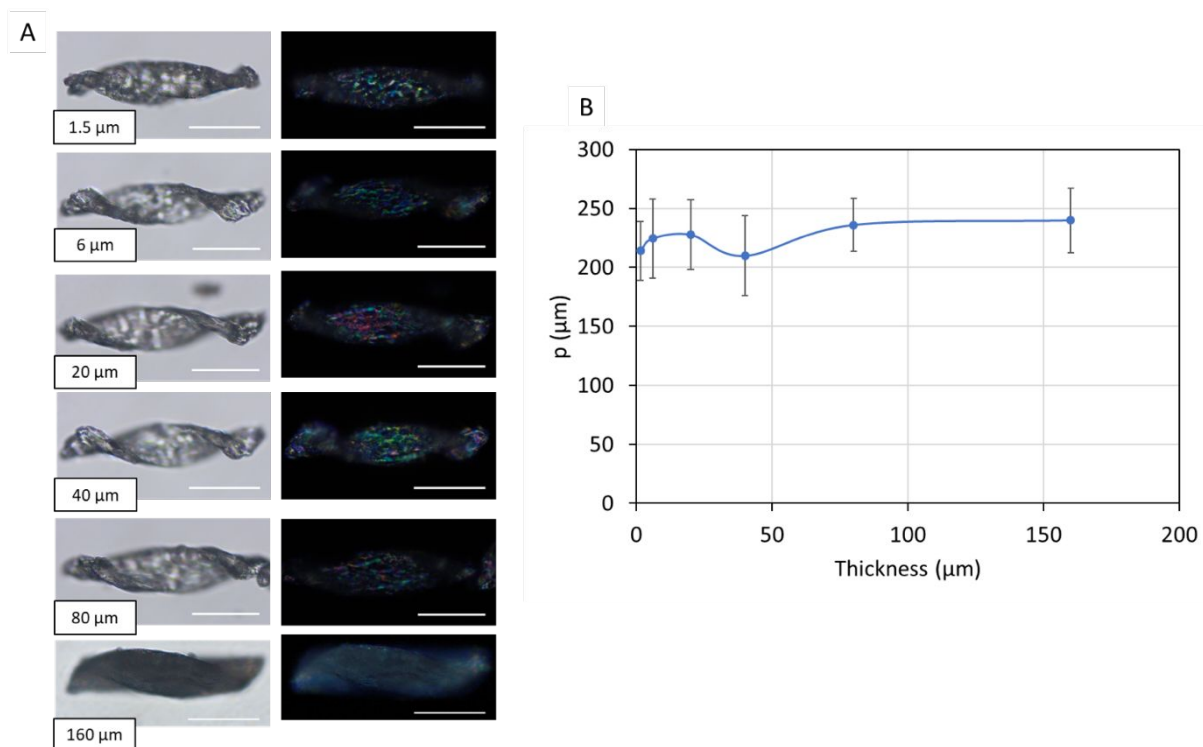


Figure S4. (A) Optical micrographs of particles obtained from mixtures of 20 wt % RM257 in E7 with left handed 30 degrees twist. The thickness of the functionalized surfaces with PVA varied between 1.5 μm to 160 μm indicated at the below of each figure. Scale bars: 50 μm . (B) The graph that show the pitch of the synthesized microparticles with respect to thickness.