

Supplementary Information

Subtle Control on Hierarchic Reflow for Simple and Massive Fabrication of Biomimetic Compound Eye Array in Polymer for Imaging at a Large Field of view

Mengjia Wang,^a Taisheng Wang,^a Honghai Shen,^a Jingli Zhao,^a Zhiyou Zhang,^b Jinglei Du,^b and Weixing Yu^{c,*}

Lithographic processes

To fabricate the BCEs shown in Fig. 3 and 4, spin-coating processes with multiple spinning steps were applied for the deposition of photoresist onto glass substrate. The process parameters for the spin-coating (speed/duration) were set as follows: i) AZ9260, 800 rpm/25 s; ii) AZ9260, 800 rpm/25 s; iii) S1813, 1000 rpm/25 s; iv) AZ9260, 4000 rpm/40 s. It should be noted that after each spin-coating step, a soft bake step was conducted on a hotplate. The soft baking for each photoresist layer has two steps. The baking parameters (temperature/duration) for the first three layers were set as 60 °C/5 min and 100 °C/5 min. The baking parameters (temperature/duration) for the last layer of photoresist were set as 60 °C/5 min and 100 °C/20 min. After that, the sample was exposed to the UV light with an exposure dosage of 2000 mJcm⁻² at a wavelength of 365 nm. The development process was conducted by immersing the exposed samples into the DI-water diluted AZ400K developer (with a volume ratio of 1:3 for AZ400K: DI water) for 5 min 30 s. For the second lithographic process, the exposure dosage and the developing time are 300 mJcm⁻² and 2 min 30 s, respectively.

Reflow processes

Firstly, the sample after exposure and development processes was placed on a hotplate for the thermal reflow process at a temperature of 95 °C for 5 min. Next, To conduct the chemical reflow process, the sample was put inside a closed container filled with saturated solvent vapor, which was formed by heating the solvent (PGMEA) at a temperature of 80 °C.

Replication processes

Firstly, poly(dimethylsiloxane) (PDMS) (Sylgard184, Dow Corning Corp.) was casted onto the photoresist BCE array and then heated on a hotplate at temperature of 65 °C for 2 hours. After that, the fully solidified PDMS was peeled off carefully, serving as the replicating mould in the following step. Next, a drop of epoxy resin (NOA68, Norland Products Inc. Cranbury, N.J.) was dispensed onto the PDMS mould and covered with a glass coverslip on the top to form a thin resin layer. Finally, the formed Micro BCE in the liquid resin was solidified by exposing it to UV light with a dosage of 10 Jcm⁻² at a wavelength of 365 nm