Supporting Information

Self-folding Nanostructures with Imprint Patterned Surfaces (SNIPS)

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Note S1: Details of the NIL stamps and methods

a. Details of master stamps used for NIL

Silicon master stamps (LightSmyth Technologies, Inc.) used for each figures are summarized in the table below.

Figure	Shape	Lattice type	Period (nm)	Width (nm)	Part number
2b, 3b	circle	Rectangular (rect) post	600	275	S2D-18B2-0808-350-P
2c, 3c	line	N/A	500	300	SNS-C20-0808-350-D60-P
2c, 3c	circle	rect post	500	135	S2D-24B1-0808-350-P
2d, 3d	line	N/A	600	260	SNS-C16.7-0808-350-D45-P
2d, 3d	circle	rect post	600	275	S2D-18B2-0808-350-P
2e-h, 4b-d	circle	hex hole	600	180	S2D-24D2-0808-350-P
4a	circle	hex post	600	165	S2D-24C2-0808-350-P

Table S1. Details of master stamps used for NIL. The dimensions listed are per vendor specifications.

b. NIL stamp cleaning and preparation process

All stamps were first O_2 plasma cleaned and silanized with trichloro (1H,1H,2H,2H-perfluorooctyl) silane (Sigma Aldrich) by vapor phase deposition at 140 °C before use. Stamps were silanized again when the resist started to stick onto its surface.

c. Details of the home-built NIL instrumentation

Commercial NIL tools are not readily accessible. Even a desktop NIL tool for everyday lab use costs few tens of thousand dollars. Hence, we also investigated the use of the creation of a bench-top, home-built NIL system (**Figure S1**). In this system, we utilized small weights and a commercial heat press (which costs less than $500) integrated with hotplates. All experiments using this system were done in ambient air which could cause air bubbles to get trapped in the film during the NIL process. One way to reduce the air bubbles was to carry out the NIL in a vacuum glove box. However, we found

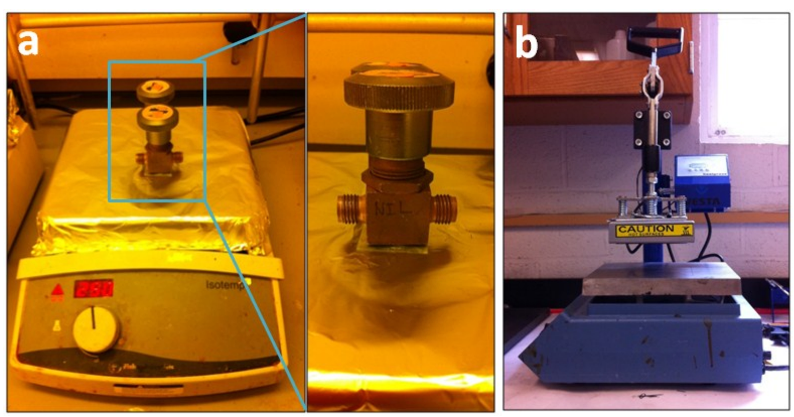

Figure S1. Photographs of two bench-top home-built NIL systems including, (a) a NIL procedure utilizing small weights (~150 g) and a hot plate in ambient air, and (b) a high pressure home-built system using a commercial heat press and hotplate.

that even with bubbles, a large number of nanofeatures could be patterned for laboratory use. When using the heat press, a cushion (such as PDMS films) had to be placed between the sample and hotplate surface or the silicon master mold and top plate of the heat press to prevent damage to the sample and the mold.

Using small weights and the high pressure heat press, we were able to pattern SU-8 and polycaprolactone (PCL) respectively as shown in **Figure S2**. Capillary force lithography (CFL) is a patterning method which utilizes capillary rise of a liquid-like molten polymer into spaces between patterns on an elastomeric mold such as a polydimethylsiloxane (PDMS).[1] Here, we casted PDMS (elastomer base to curing agent ratio 10:1) onto the Si master stamp with nanopatterns and cured at 90 °C for 3 hours. The PDMS negative replica of the master stamp was then detached from the master stamp and was cut into a small piece. We then placed the PDMS stamp onto a PMMA A2 (MW 950K, MicroChem Corp.) coated Si wafer on a hotplate at 300 °C for 2 hours. A small weight of ~150 g was put on top of the PDMS to aid in conformal contact between the replica stamp and PMMA. After cooling the sample down to room temperature, the PDMS was peeled from the sample resulting in nanopatterned PMMA. Here, we have shown that various polymeric materials can be patterned using simple systems such as small weights, commercial heat press and PDMS replica stamps without the need to using expensive imprint tools.

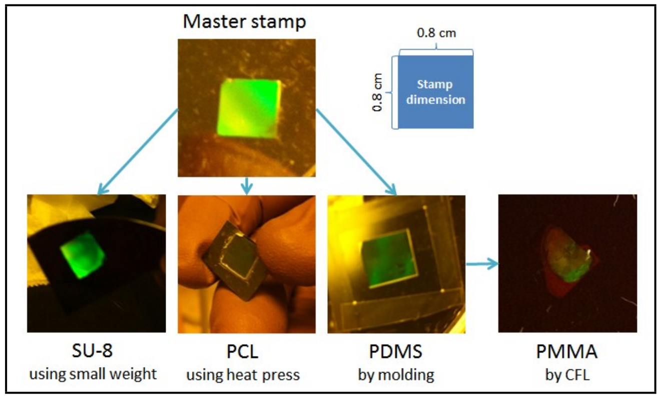

Figure S2. NIL realized using a variety of methods and materials.

Note S2: Evidence for tighter tubular SNIPS formed with thinner films.

We observed a tighter and more uniform tubes formed when tubular Al_2O_3 / Sn SNIPS with Au patterns have thinner Al_2O_3. These SNIPS are composed of 3 nm Al_2O_3 whereas in Fig. 2d and Fig. 3d, SNIPS are composed of 6 nm Al_2O_3 with other parameters kept same. We rationalize this observation by noting that since the underlying Al_2O_3 layer is thinner, its bending rigidity is significantly lower causing enhanced curvature.

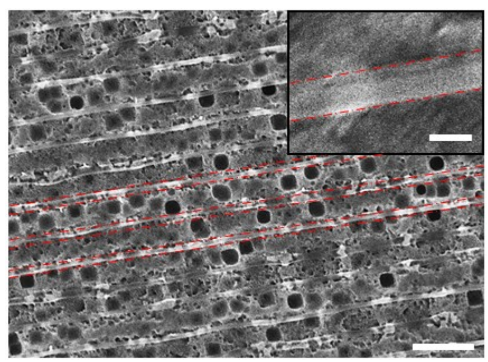

Figure S3. Tubular Al_2O_3 (3 nm)/ Sn (5 nm) SNIPS with Au patterns. Scale bars are 1 μm for the main image and 100 nm for the inset.

Supporting information Reference

1. K. Y. Suh, Y. S. Kim and H. H. Lee, *Advanced Materials*, 2001, **13**, 1386-1389.