

Supporting Information

A route to engineered high aspect-ratio silicon nanostructures through regenerative secondary mask lithography

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Supporting Figures

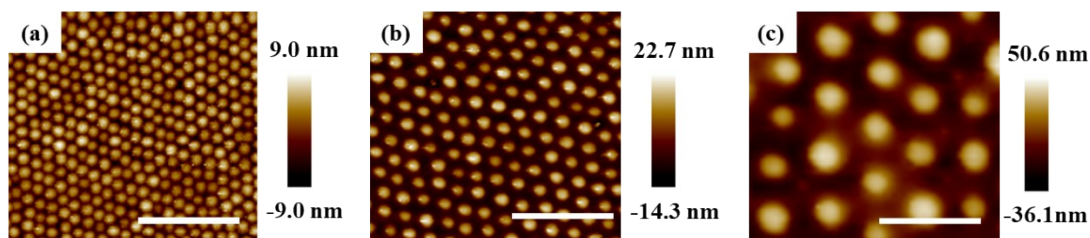


Figure S1. AFM images of hexagonally packed PS-*b*-P2VP micellar bumps generated from direct spin coating onto Si/SiO₂. The molecular weight M_w dictates the pitch p of the micelles and varies across (a-c) with $M_w / \text{kg mol}^{-1} = 57\text{-}b\text{-}57$, $109\text{-}b\text{-}90$, and $440\text{-}b\text{-}353$, giving rise to $p = 56$, 95 , and 257 nm, respectively. Scale bars = 500 nm.

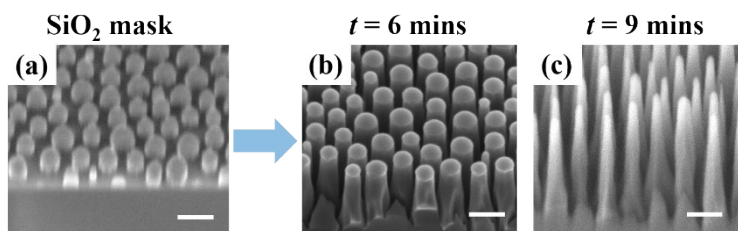


Figure S2. SEM images of the structures generated from a hard mask with $d = 112$ nm. (a) SEM image of the hard mask, which under coil power 300 W and platen power 40 W yields straight walled nanopillars (b) with mask remaining after 6 min. Etching for a further 3 min under the same condition yields slender high AR nanopillars. Scale bars = 200 nm.

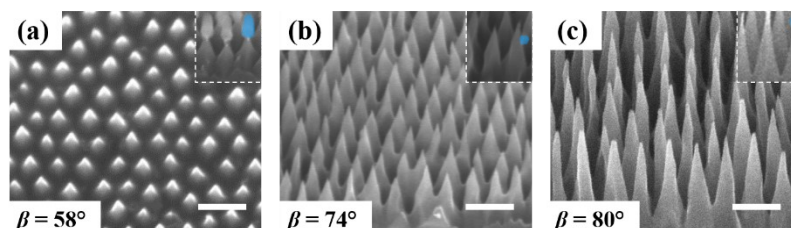


Figure S3. SEM images of sharp nanocones with varying slope angles after HF treatment (inset = before HF treatment, with remaining SiO₂ hard mask highlighted in blue). (a) Nanocones with $\beta = 58^\circ$, generated from a hard mask of $h = 70$ nm under mixed plasma of Cl₂ (18 sccm) and SF₆ (2 sccm) at coil power 300 W, and platen power 10 W for 3 min. (b) Nanocones with $\beta = 74^\circ$, generated from a hard mask of $h = 40$ nm under Cl₂ plasma (20 sccm) at coil power 200 W, and platen power 10 W for 25 min, followed by 1 min etching under mixed plasma: Cl₂ (19 sccm) and SF₆ (1 sccm). (c) Nanocones with $\beta = 80^\circ$, generated from a hard mask of $h = 100$ nm under Cl₂ plasma (20 sccm) at coil power 200 W, and platen power 15 W for 15 min. Scale bars = 200 nm.

Supporting Videos

Supporting Video 1 – Slow-motion video of a bouncing droplet upon impacting the nanostructured 6-inch silicon wafer. The video was recorded using a high-speed camera. A water droplet of 8 μ L was deposited from a height of 1 cm, giving rise to 19 bounces.

Supporting Video 2 – Self-cleaning effect of the superhydrophobic and antireflective 6-inch silicon wafer. The self-cleaning effect enables efficient removal of black pepper powder by a stream of water.