Electronic Supplementary Material (ESI) for Soft Matter.

Supporting Information

Small Degree of Anisotropic Wetting on Self-Similar Hierarchical Wrinkled Surfaces

*Gaojian Lin[†], Qiuting Zhang[†], CunjingLv[‡], Yichao Tang[†] and Jie Yin[†,]**

[†]Applied Mechanics of Materials Laboratory, Department of Mechanical Engineering

Temple University, 1947 North 12th Street, Philadelphia, PA 19122, USA

[‡]Department of Engineering Mechanics, Tsinghua University, Beijing, 100084, China

* Corresponding Author: jieyin@temple.edu

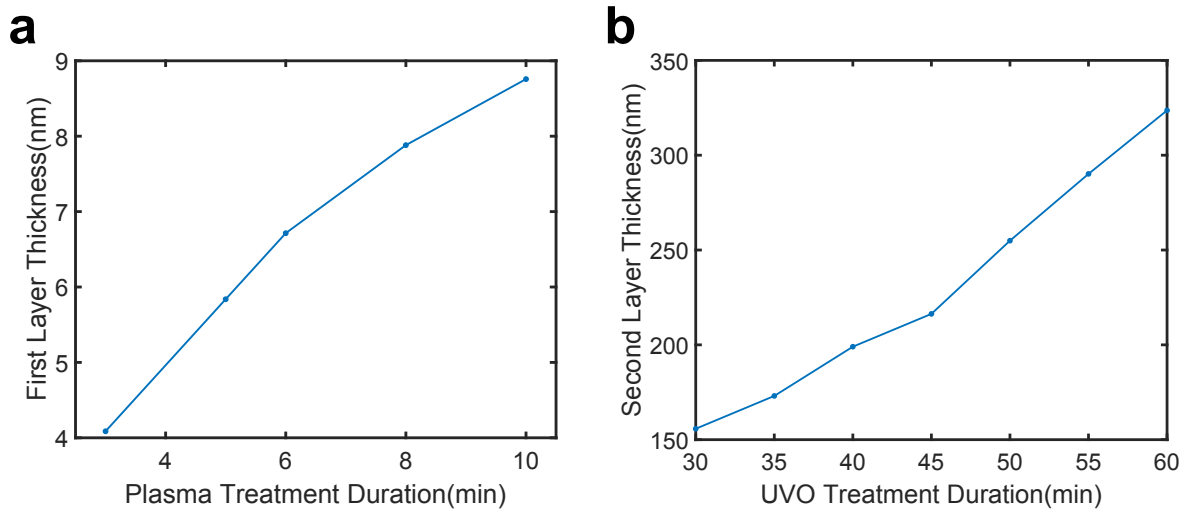


Figure S1. (a) The thickness of first layer stiff film generated on first strain release as a function of the Plasma treatment time. (b) The thickness of second layer stiff film generated on second strain release as a function of the UVO treatment time.

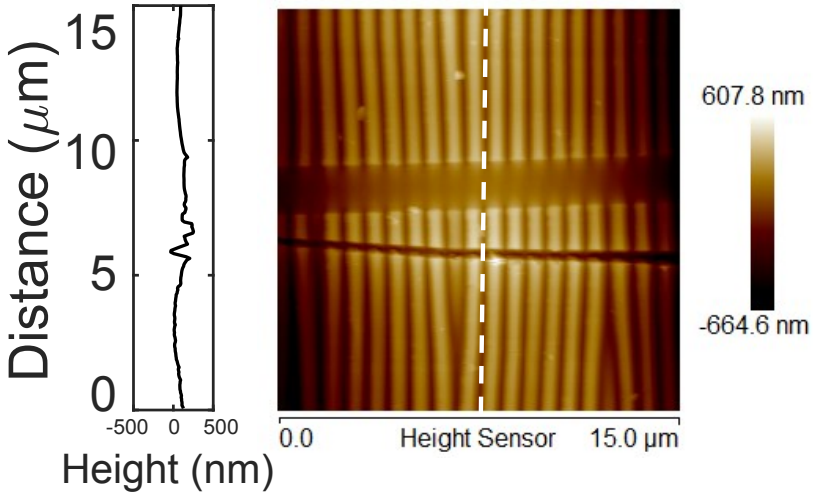


Figure S2. AFM images of hierarchical wrinkling surface with $\varepsilon_1=\varepsilon_2=25\%$, T_1=5min, T_2=40min. From the cross sectional profile located at the valley of small wrinkles, it can be seen that the wide crack disappears but narrow cracks exist, indicating the wide cracks occur during the first release.

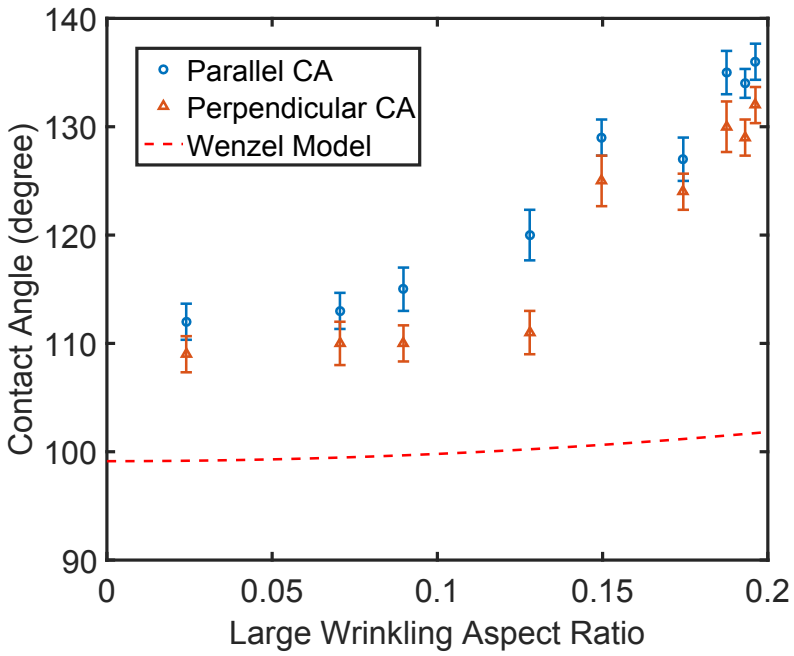
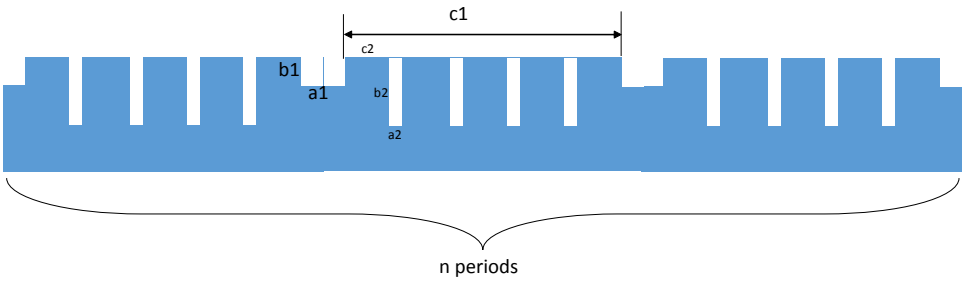


Figure S3. Relation between the measured contact angles and Wenzel contact angles

Calculation of ϕ_s and r of Cracks:

Calculations for ϕ_s and r in Cassie and Wenzel equations resulted from cracks based on a simplified model are shown below. All dimensions in the schematics shown below, in micrometers, are based on the SEM images and AFM images. In all calculations, n is the number of large wrinkles covered by the droplet; a1=1.8μm, b1=0.2μm, c1=33μm and a2=0.7μm, b2=0.52μm, c2=6μm are the width, depth, interval of cracks generated in first release and second release, respectively. The magnitude of n is adequately large, since at least hundreds of cracks are covered. Based on this value, we can estimate that the surface roughness factor r and the solid fraction $\emptyset_s$ as below:



$$\phi_s = \frac{c2 * 5n}{C1 * n + a1 * (n-1)} = \frac{6 * 5n}{33n + 1.8(n-1)} = 0.86$$

$$r = \frac{[c1 * n + (n-1) * a1] + 2n * b1 + b2 * 8n}{c1 * n + (n-1) * a1} = \frac{[33n + 1.8(n-1)] + 2n * 0.2 + 0.52 * 8n}{33n + 1.8(n-1)} \approx 1.13$$