Hybrid Surface Patterns Mimicking the Design of the Adhesive Toe Pad of Tree Frog

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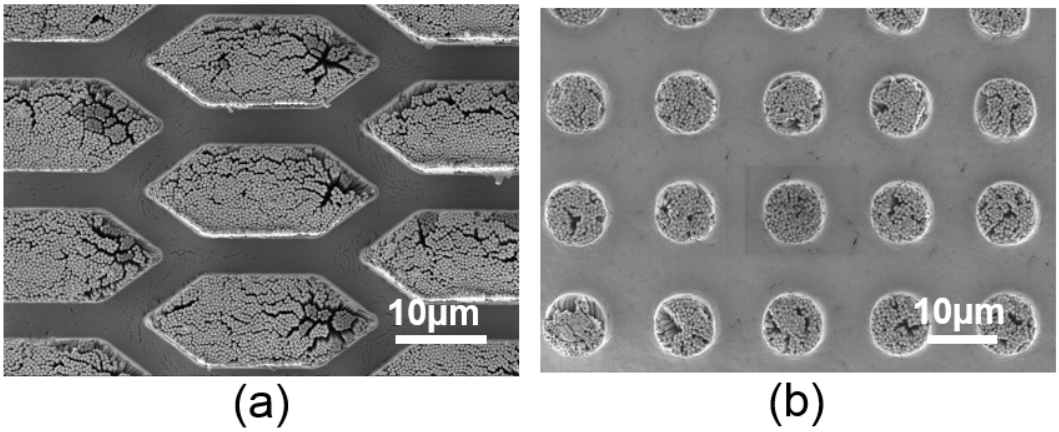

Figure S1. SEM images of PS nanorod array patterned by nickel mould insert with (a) elongate hexagonal pattern and (b) round pattern.

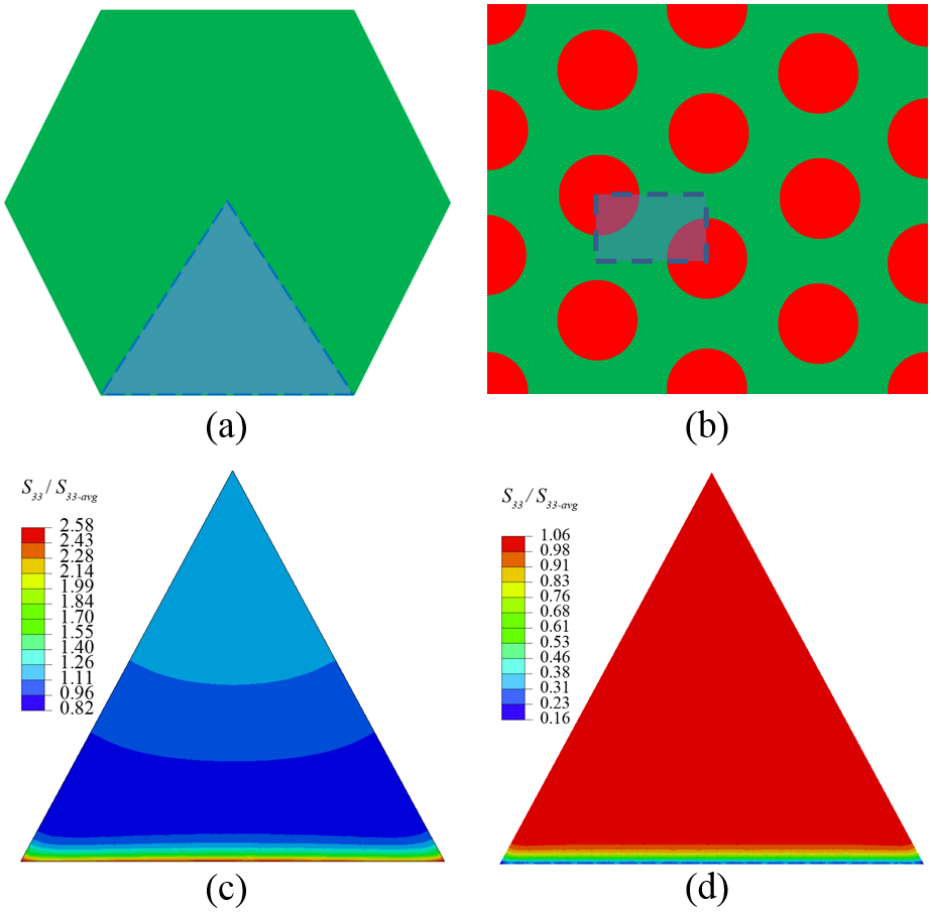

Figure S2. (a) Due to the symmetric nature of the hexagonal micropillar, 1/6 of the pillar is simulated using finite element analysis. (b) Schematic drawing of the hexagonally arranged PS nanorods (blue) in PDMS matrix (dark yellow), the dashed box is a representative cell for simulation. (c) The simulation results of stress distribution on the (c) pure PDMS micropillar and (d) PDMS micropillar with one rigid PS core. It should be noted that on the (c) pure PDMS micropillar, the highest stress (2.58) is located at the pillar edge (bottom edge of the triangle). When there is only one PS core in PDMS micropillar, which means the size of PS core is similar to that of the PDMS micropillar, the stress minimum is located at the pillar edge. And the stress within the contact area is quite homogeneous. The stress maximum only reaches 1.06.

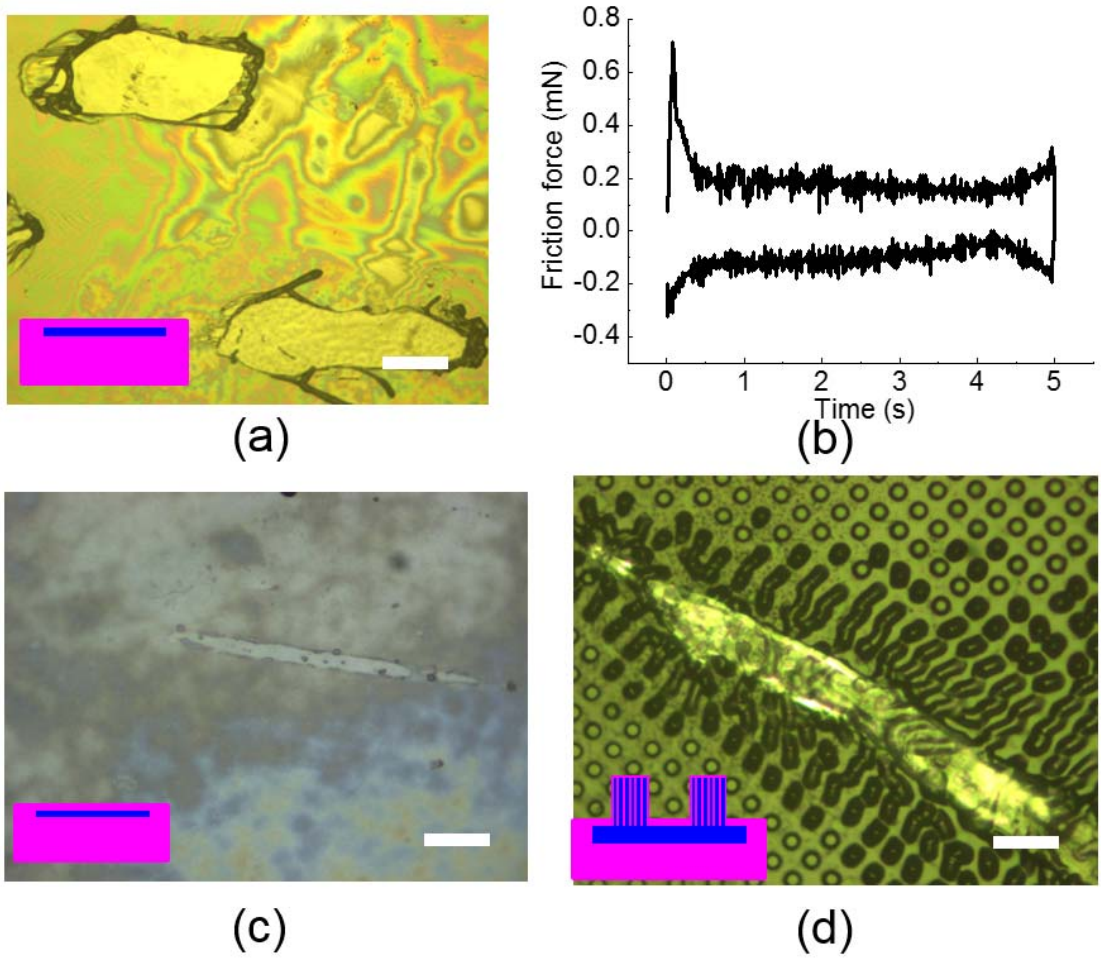

Figure S3. (a) Friction tests on sandwiched structures with a thin flat PS layer in between two PDMS layers without surface modification of the PS layer. (b) Typical friction curve on the sandwiched structure with flat PS layer in between. (c) Friction test on sandwiched structure with a thin flat PS layer in between two PDMS layers with the PS layer modified with oxygen plasma. (d) Friction test on a composite structure with a PS nanorod array embedded in PDMS. The scale bar, shown in white, in (a, b, d) equals 100 μm. The inserts in (a, b, d) show the corresponding structure. Purple and blue colors represent PDMS and PS, respectively. Insets are not to scale.

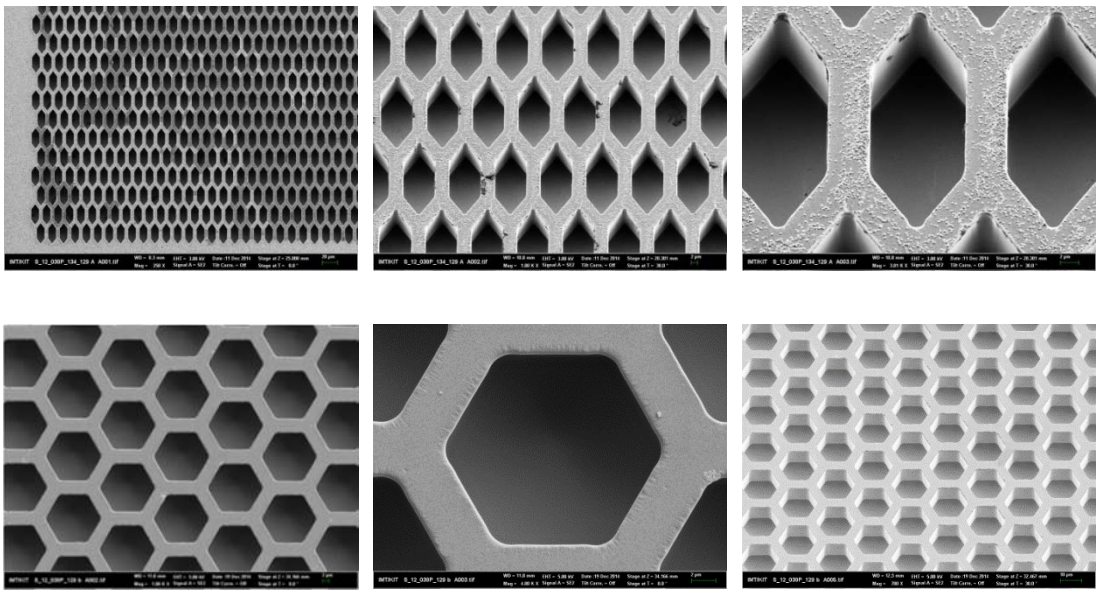

Figure S4. SEM images of the pattern on the nickel mould insert

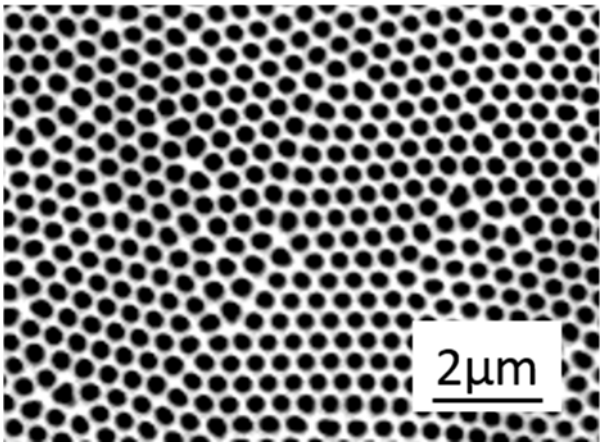

Figure S5. SEM image of AAO template with pore diameter of 330 nm.

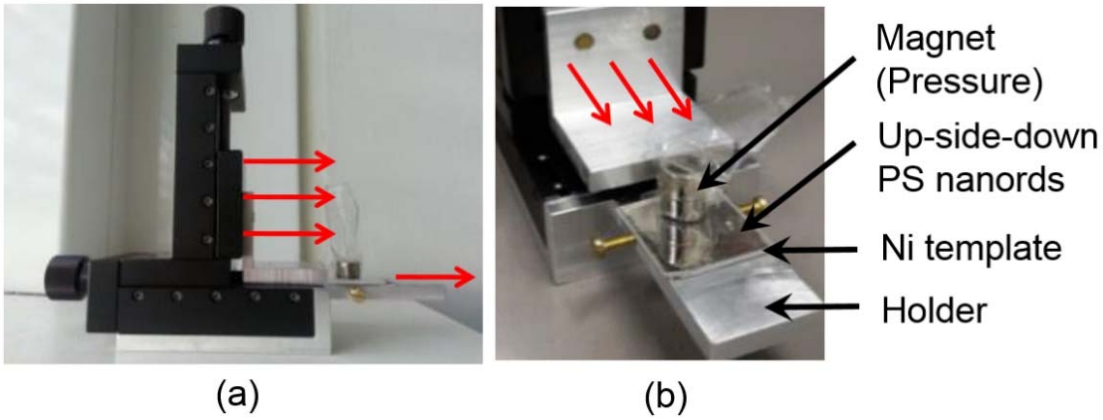

Figure S6. (a) Home-made device to break the nanorods. Two screw-driven translation stages are perpendicularly arranged. The one on bottom can push the upper one to right, as indicated by the red arrows. The upper manipulator is used to adjust the height of the Al alloy pusher (upper part in b), that is used to apply the shear force. (b) The Al alloy holder is mounted onto the base plate of the lower manipulator. The nickel mould insert was placed on the holder with the pattern facing upwards. The PS plate with the PS nanorods facing down was put on top of the nickel insert. The assembly of the PS nanorod and nickel insert clamped together with strong magnets and then shear was applied via movement of the bottom stage.