Supporting Information for

Preparation of Stable Superhydrophobic Mesh with a Biomimetic Hierarchical Structure

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Experimental details

Materials: Stainless steel (SS) mesh with a pore size of 100 μm was purchased from HanKook Metal (Korea). Pyrrole monomer, aniline monomer, ammonium persulfate (APS), and sodium dodecyl sulfate (SDS) were purchased from Sigma Aldrich. HCl (35%) and $HClO_4$ (70%) were purchased from Samchun Chemical (Korea). Teflon solution (Teflon® AF 601S1-100-6) was purchased from Dupont, and fluorocarbon solvent (FC-40) was purchased from 3M. All aqueous solutions were prepared with deionized (DI) water (>18 MΩcm).

Synthesis of PPy micropapillas: PPy micropapilla structures were synthesized on bare SS mesh via electropolymerization. The SS mesh was cleaned with acetone by sonication and rinsed with isopropyl alcohol and DI water. For electropolymerization, the SS mesh and Pt electrode were immersed in an aqueous electrolyte solution containing 0.5 wt% SDS, 0.01 M HCl, and 0.1M pyrrole. An electrical potential (1~1.5 V) was applied between the SS mesh (anode) and Pt electrode (cathode) using a DC power supply for 30~60 s. After PPy micropapilla synthesis on the SS-mesh surface, the meshes were immersed in DI water for ~1 h to remove SDS from the surface and dried under N_2 gas flow.

Synthesis of PANI nanofiber: PANI nanofiber structures were synthesized on the PPy micropapilla-coated SS mesh (PPy-SS-mesh) by chemical polymerization. The PPy-SS-mesh was immersed in an aqueous solution containing 1 M $HClO_4$, 6.7 mM APS, and 10 mM aniline. Aniline monomers were polymerized at temperatures of 0~4°C while stirring the reaction mixture for 12~24 h. After synthesis of the PANI nanofiber structures on the PPy-SS-mesh surface, the meshes were immersed in DI water for ~1 h for cleaning and dried under N2 gas flow.

Teflon coating: The as-prepared mesh surfaces were coated with Teflon for low surface energy. Before Teflon coating, the meshes were dried at 150°C in a convection oven to remove water molecules from the surface. The meshes were dipped in a 0.5% Teflon solution diluted using FC-40 for 10 min, and the Teflon coating was cured in an oven at 200°C for 30 min.

Characterization: Scanning electron microscopy (SEM) images were obtained by a field emission (FE)-SEM instrument (SU-6600, Hitachi, Japan). Static water-contact angles (WCA) were measured between 5-μL DI water droplets and the nanostructured surface using a drop-shape analysis system (DSA 100, Kruss, Germany) in the sessile drop method.

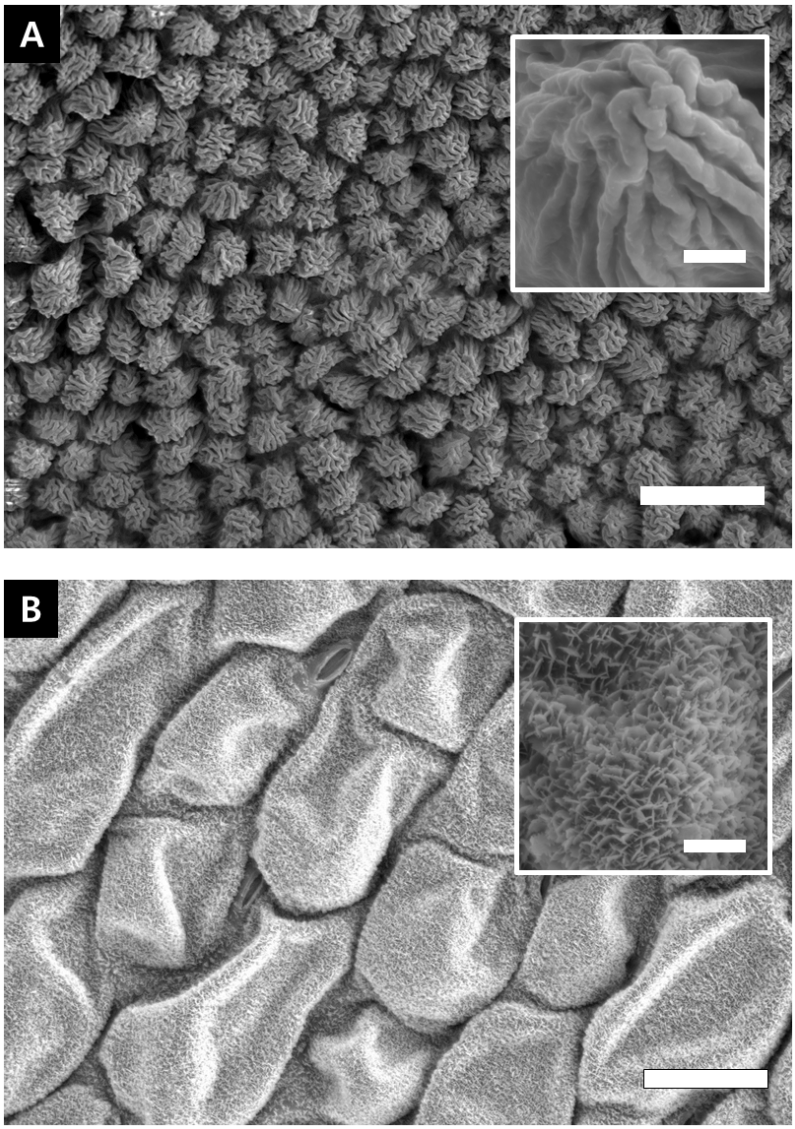

Fig. S1 SEM images of a bio-inspired hierarchical structure (scale bar: 20μm). Insets show a high-magnification view (scale bar: 20μm). SEM images of the surfaces of (A) red rose petals and (B) a *Trifolium repens* leaf.

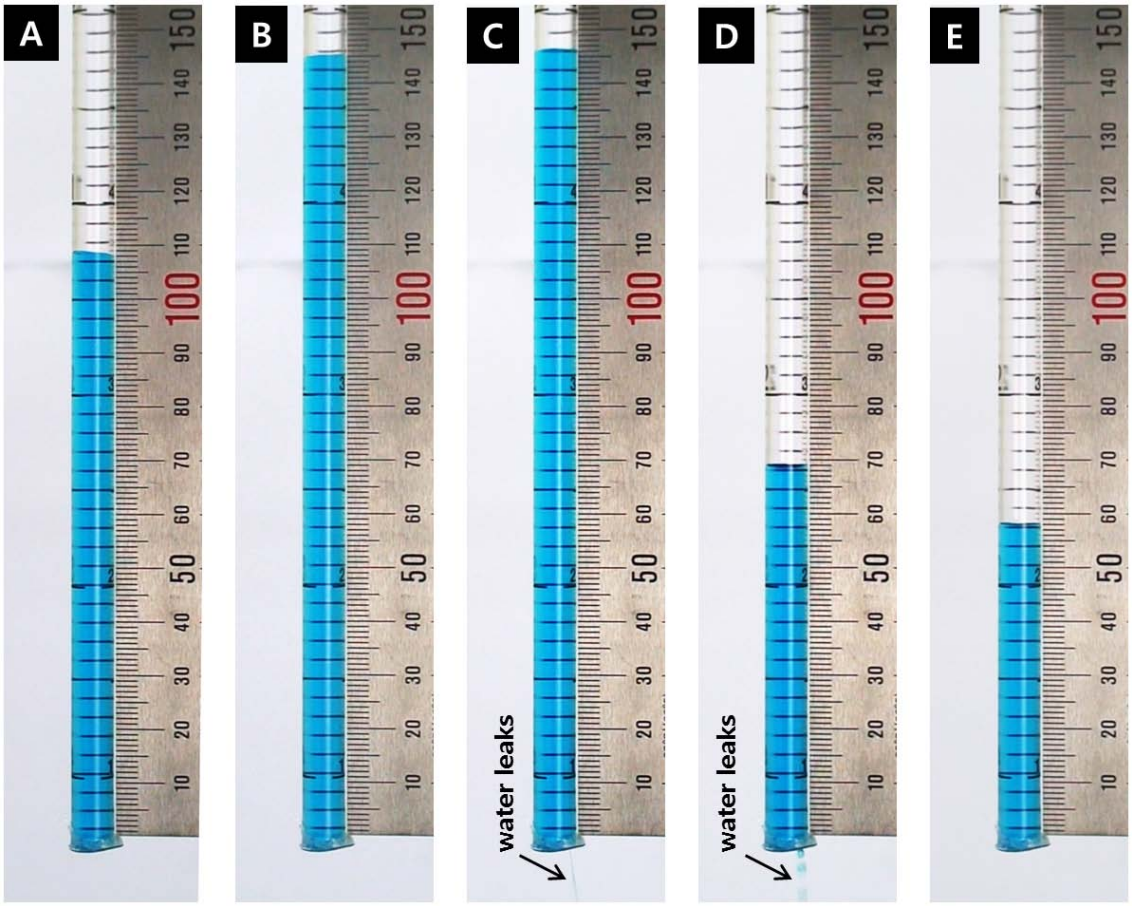

Fig. S2 Photographs of the experimental process for testing water-pressure resistance. A vertical standing tube was slowly filled with water (A), and the maximum height of the water was measured for static water-pressure resistance when water started to escape through the mesh (B–C). The water supply was stopped, and the height of the water was measured for dynamic water-pressure resistance when the water stopped escaping through the mesh (D–E).