

## Electronic Supplementary Information

### Under-Water Unidirectional Air Penetration via a Janus Mesh

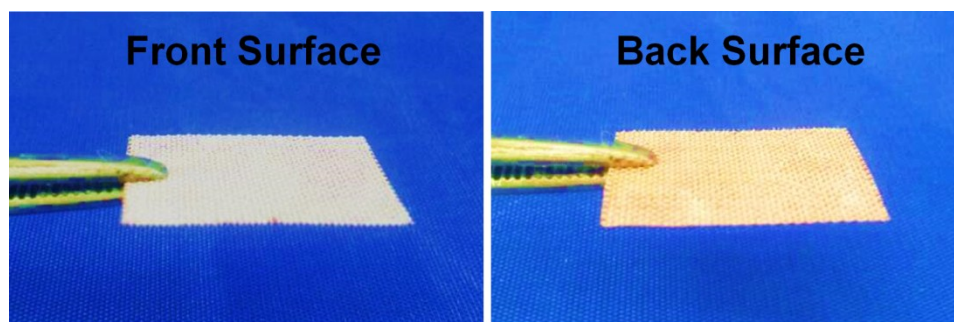
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#### Materials and Characterization

The TiO<sub>2</sub> nanoparticle with an average of 21 nm and the 1-Dodecanethiol were purchased from sigma-Aldrich Corp. The morphologies of the Janus mesh were observed by a field-emission scanning electron microscope (JSM-7500F, Japan). The chemical composition of the Janus mesh was investigated by the Energy Dispersive Spectrometer on a ProX Microscopy (Phenom-World, Netherlands). The contact angles of the sample were recorded and measured by the contact angles analyzer (OCA 20, Data-physics, Germany). The detailed processes of air penetration were recorded with a high speed video camera (i-speed 3, Olympus, Japan).

#### Optical images of the liquid film on the mesh



**Fig. S1.** The optical images exhibited that the TiO<sub>2</sub> slurry can be conveniently coated on the front surface of the pristine copper mesh without wetting the back surface.

### The elemental analysis of the Janus mesh

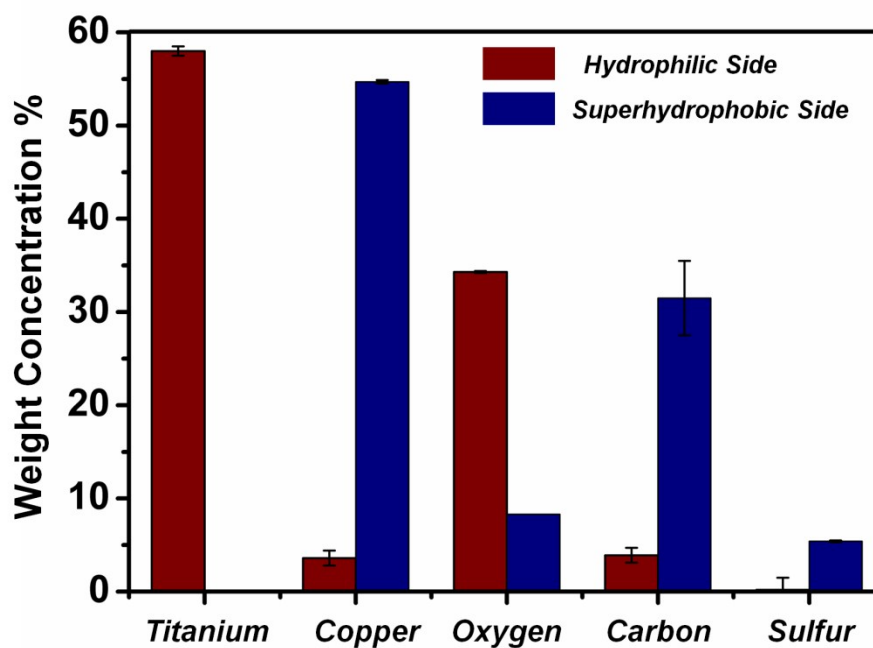
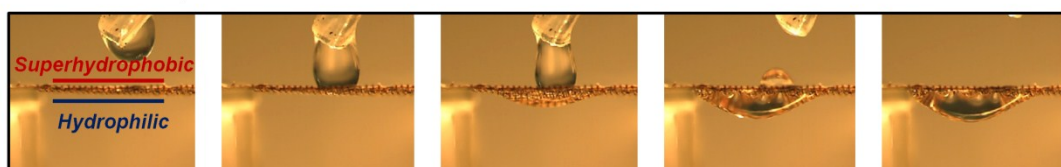


Fig. S2. The detailed elemental analysis on the each surface of the Janus mesh

### The unidirectional water penetration through the Janus mesh

#### Successful penetration



#### Fail to penetrate

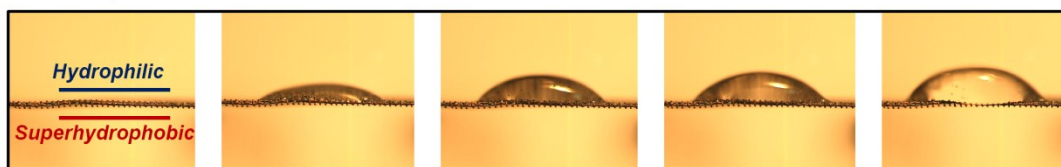
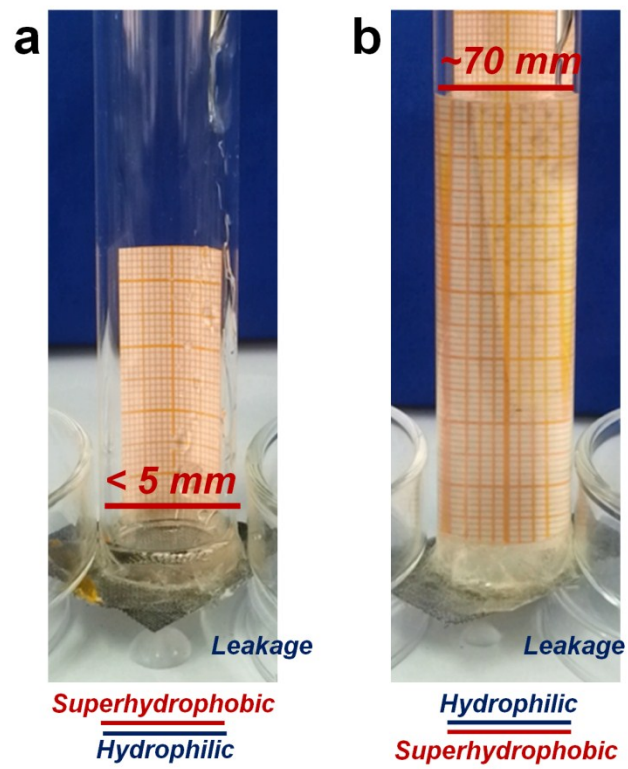


Fig. S3. The unidirectional water penetration was achieved via the same Janus mesh.

The test on the water penetration pressure of the Janus mesh



**Fig. S4.** The test of water penetration pressure was conducted, as the superhydrophobic placed (a) upwards and (b) downwards.