Electronic Supplementary Information

Under-Water Unidirectional Air Penetration via a Janus Mesh

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Materials and Characterization

The TiO$_2$ 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$_2$ 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

![Elemental Analysis Graph](image)

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

The unidirectional water penetration through the Janus mesh

*Successful penetration*

![Successful Penetration Images](image)

*Fail to penetrate*

![Fail to Penetrate Images](image)

*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.