Supplemental Information

A “PDMS-in-Water” Emulsion Enables Mechanochemical Robust Superhydrophobic Surface with Self-healing Superhydrophobic Nature

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**Figure S1.** The optical images of the droplets dyed by methyl blue on (a) pristine cotton fabric and (b) PDMS@cotton fabric fabricated in PDMS-in-Water emulsion.

**Figure S2.** The relationship between the water contact angle and PDMS concentration for PDMS@cotton fabric fabricated in (a) PDMS-in-THF, (b) Toluene, (c) Hexadecane and (d) Dichloromethane solution.

**Figure S3.** SEM images of PDMS@cotton fabric by dip-coating in (a) PDMS-in-Toluene, (b) PDMS-in-Hexadecane, and (c) PDMS-in-Dichloromethane solution, respectively.

**Figure S4.** Narrow C 1s spectra of PDMS@cotton fabric.

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**Figure S7.** Optical images of anti-fouling ability of (a) pristine cotton fabric and (b) PDMS@cotton fabric in methyl blue-based solution.

**Figure S8.** Self-cleaning performance of (a) pristine cotton fabric and (b) PDMS@cotton fabric. (c) Schematic illustration of self-cleaning mechanism for PDMS@cotton fabric.

**Figure S9.** Absorption processes of light oil on the water surface by PDMS@cotton fabric.

**Table S1.** Physical properties of pristine cotton fabric, PDMS@cotton fabric fabricated in PDMS-in-Water emulsion and PDMS-in-THF solution, respectively.
1. Experimental Section

**Materials and reagents:** Cotton fabric was bought from Shanghai Textile Industry. THF, hexadecane, dichloromethane, trichloromethane and toluene were purchased from Sigma-Aldrich and used without further purification. PDMS pre-polymer (Sylgard 184A) was from Dow Corning Corporation.

**Preparation of dip-coating solution:** PDMS was dissolved in THF, hexadecane, dichloromethane and toluene separately, and then stirred for 20 min to obtain homogeneous solutions. Besides, in order to dissolve PDMS in water, PDMS was pretreated by plasma treatment in air. And then PDMS-in-Water emulsion can be obtained by simply dispersing PDMS in water with different ratio of PDMS, followed by ultrasonication at 30-40 °C for 30 min.

**Synthesis of superhydrophobic PDMS@cotton fabric:** The cotton fabric was firstly ultrasonicated in toluene and ethanol solution to remove the plant wax layer, exposing large quantities of hydroxyl groups on outer surface of the fiber. Then, cotton fabric was dipped into the as-prepared PDMS-in-Water emulsion for 3 min and subsequently dried at 80 °C for 1 h in an electrical oven.

**Characterizations of superhydrophobic PDMS@cotton fabrics:** The size and distribution of PDMS in water were measured by a particle sizer (90Plus Zeta). The microstructures of PDMS@cotton fabric were characterized using a field emission scanning electron microscope (FESEM, ZEISS G300) at 5.0 kV. An energy dispersive X-ray spectrometer (EDS) fitted to the FESEM was used for elemental analysis. X-ray photoelectron spectroscopy (XPS, KRATOS, Axis Ultra HAS) was employed to analyze the chemical composition of the superhydrophobic PDMS@cotton fabric. Fourier transform infrared (FTIR) spectroscopy was performed with a Nicolet 5700 instrument. The optical photographs were captured by the optical microscope (LEICA DM2500P). The wetting properties of the treated cotton fabric were measured using a Krüss DSA 100 (Krüss Company, Germany) apparatus. The volume of droplets used for static contact angle measurements was 6 μL. In addition, tensile strength and elongation at break were tested by electronic fabric strength machine (INSTRON-3365). Air permeability was investigated by using a digital
air permeability measuring instrument (YG461E-11). The washing durability of PDMS@cotton fabric was examined by accelerated laundering durability test according to the AACC 61-2006 standard method under conditions of 2A. As for an abrasion test, the superhydrophobic PDMS@cotton fabric was subjected to 3.5 kPa with pristine cotton fabric serving as an abrasion surface and the tested sample was dragged in one direction with a speed of 3 cm s$^{-1}$. 
2. Supporting Figures

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**Figure S9.** Absorption processes of light oil on the water surface by PDMS@cotton fabric. Toluene was used as light oil.
<table>
<thead>
<tr>
<th>Property</th>
<th>Tensile strength (N cm(^{-1}))</th>
<th>Elongation at break (%)</th>
<th>Air permeability (mm s(^{-1}))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Warp</td>
<td>Weft</td>
<td>Warp</td>
</tr>
<tr>
<td>Pristine</td>
<td>194±5</td>
<td>261±6</td>
<td>20.1±1.2</td>
</tr>
<tr>
<td>PDMS-in-THF solution</td>
<td>55±12</td>
<td>126±9</td>
<td>20.8±1.0</td>
</tr>
<tr>
<td>PDMS-in-Water emulsion</td>
<td>210±7</td>
<td>275±8</td>
<td>21.5±0.9</td>
</tr>
</tbody>
</table>

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