Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.


# Supplementary Information

## Inorganic adhesives for robust, self-healing, superhydrophobic surfaces

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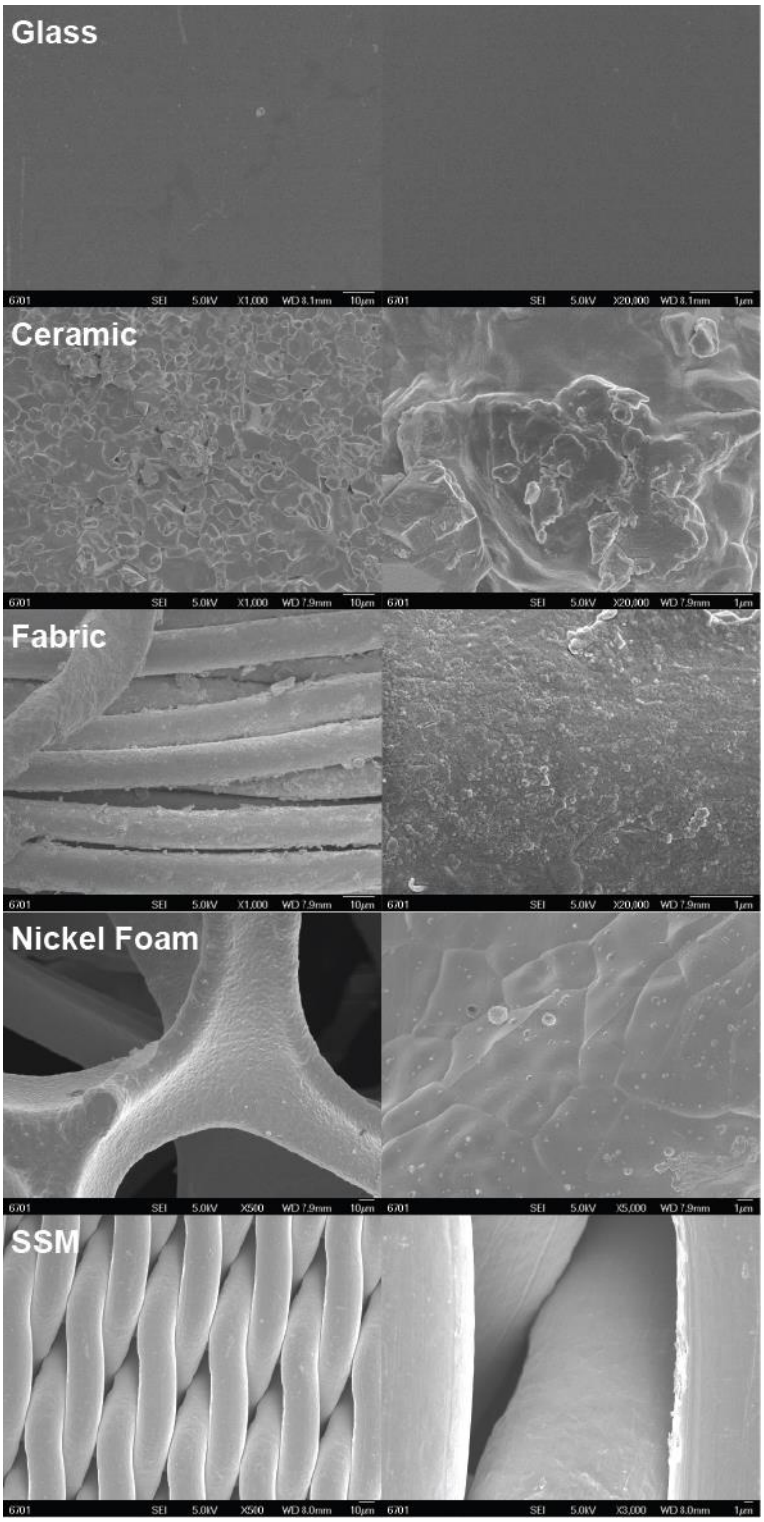


**Fig. S1** SEM images of original substrates.

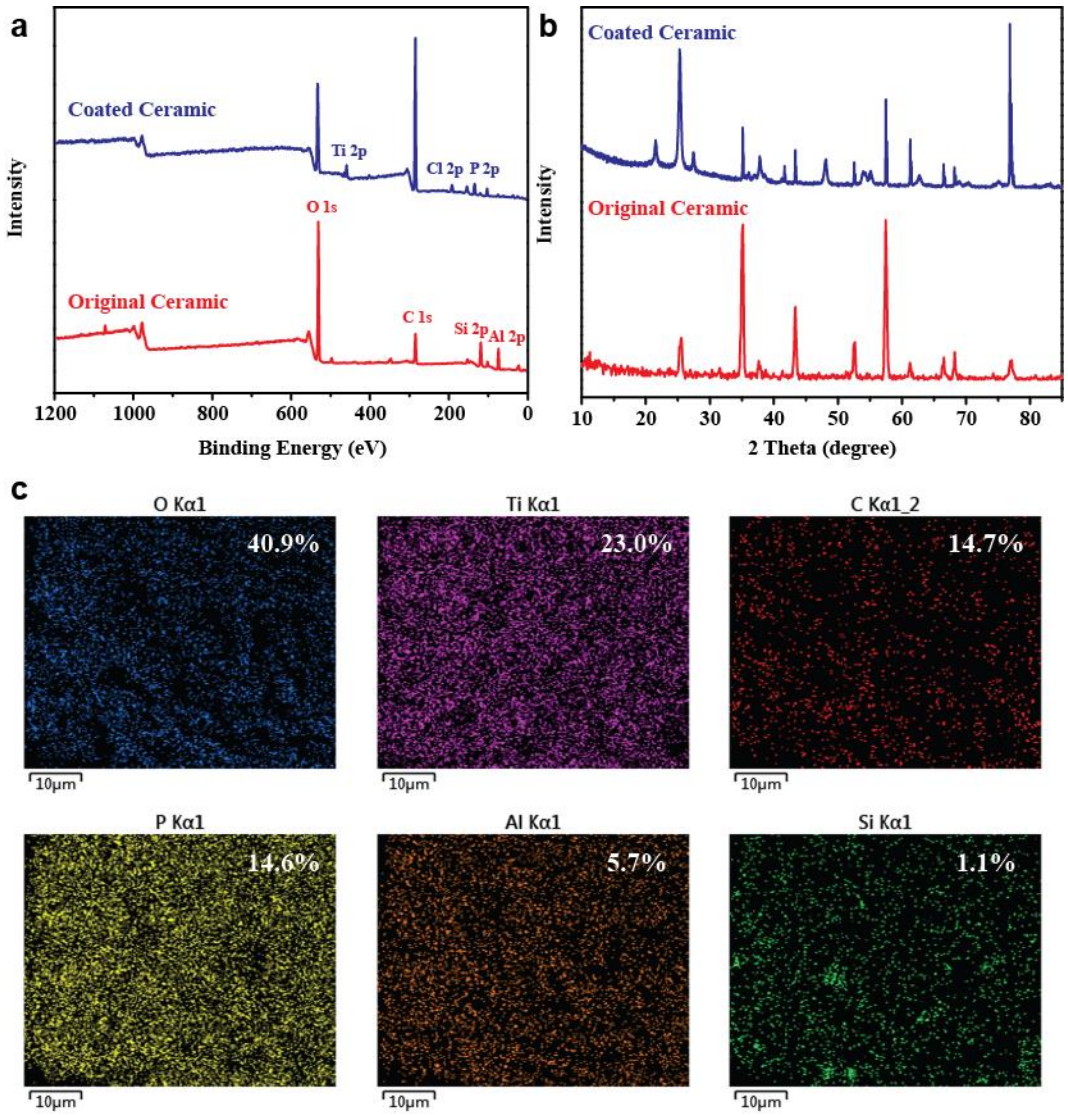


**Fig. S2** (a) XPS spectra of original and AP-$TiO_2$@OTS coated ceramic. (b) XRD patterns of original and AP-$TiO_2$@OTS coated ceramic. (c) Element distribution maps of AP-$TiO_2$@OTS coated ceramic.

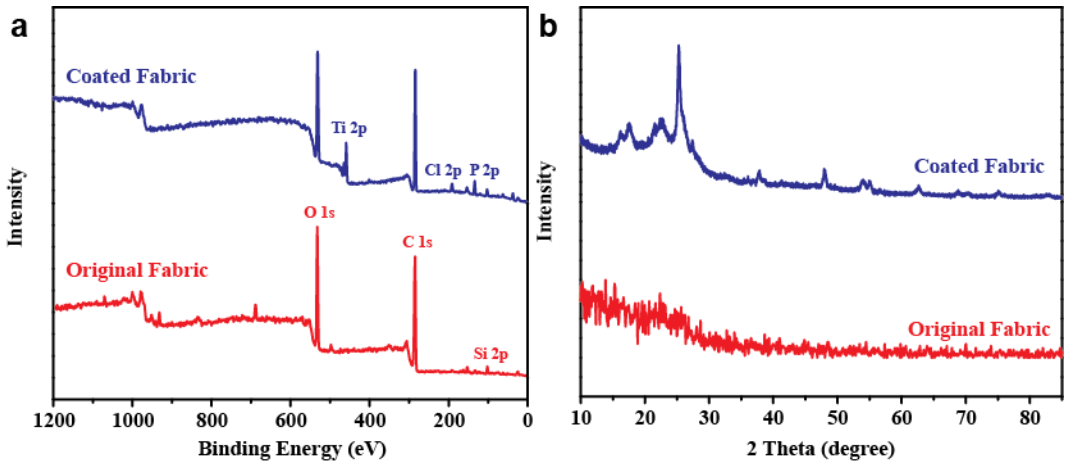


**Fig. S3** (a) XPS spectra of original and AP-$TiO_2$@OTS coated fabric. (b) XRD patterns of original and AP-$TiO_2$@OTS coated fabric.

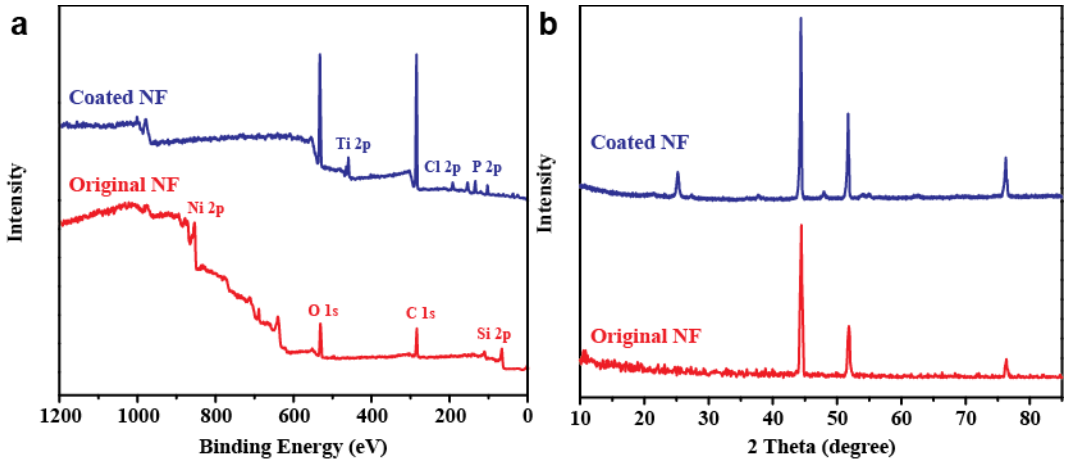


**Fig. S4** (a) XPS spectra of original and AP-$TiO_2$@OTS coated nickel foam. (b) XRD patterns of original and AP-$TiO_2$@OTS coated nickel foam.

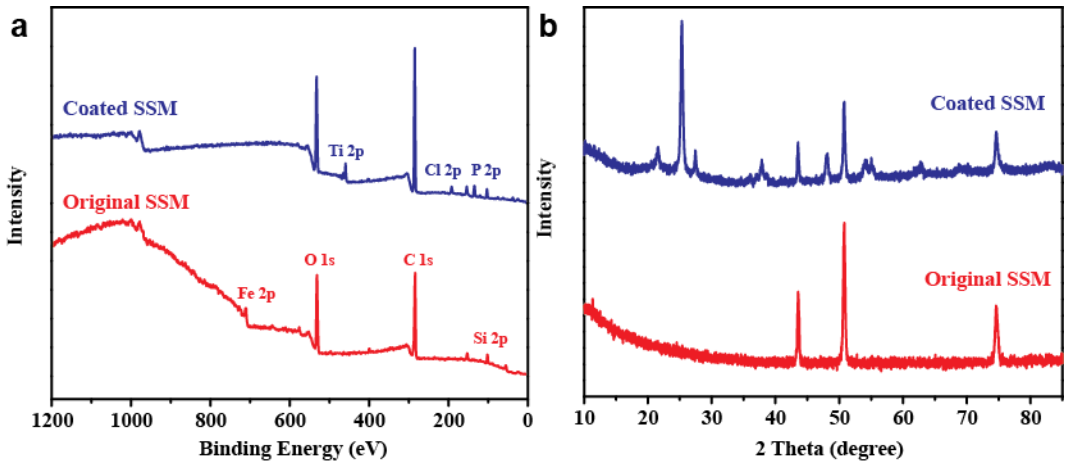


**Fig. S5** (a) XPS spectra of original and AP-$TiO_2$@OTS coated SSM. (b) XRD patterns of original and AP-$TiO_2$@OTS coated SSM.

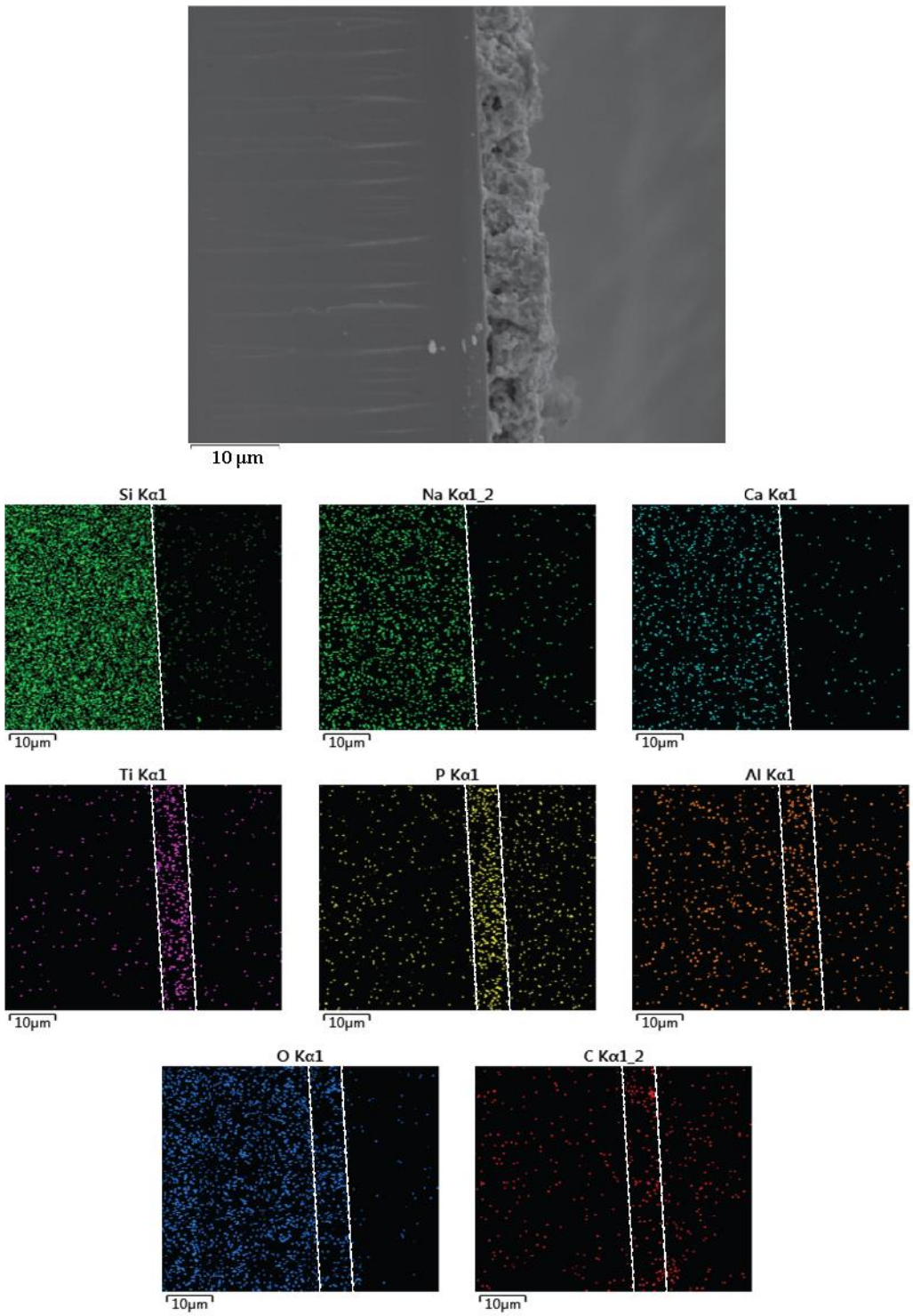


**Fig. S6** Cross-section SEM image and element distribution maps of AP-$TiO_2$@OTS coated glass.

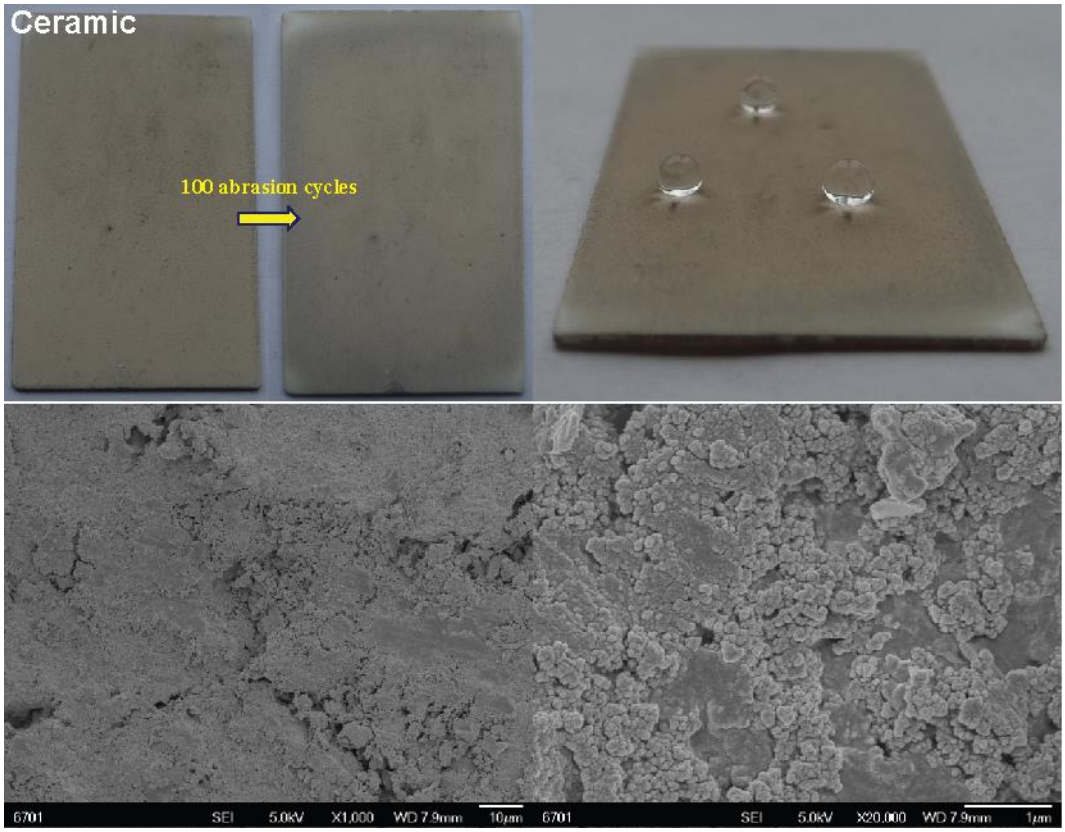


**Fig. S7** Photographs and SEM images of the coated ceramic after 100 abrasion cycles.

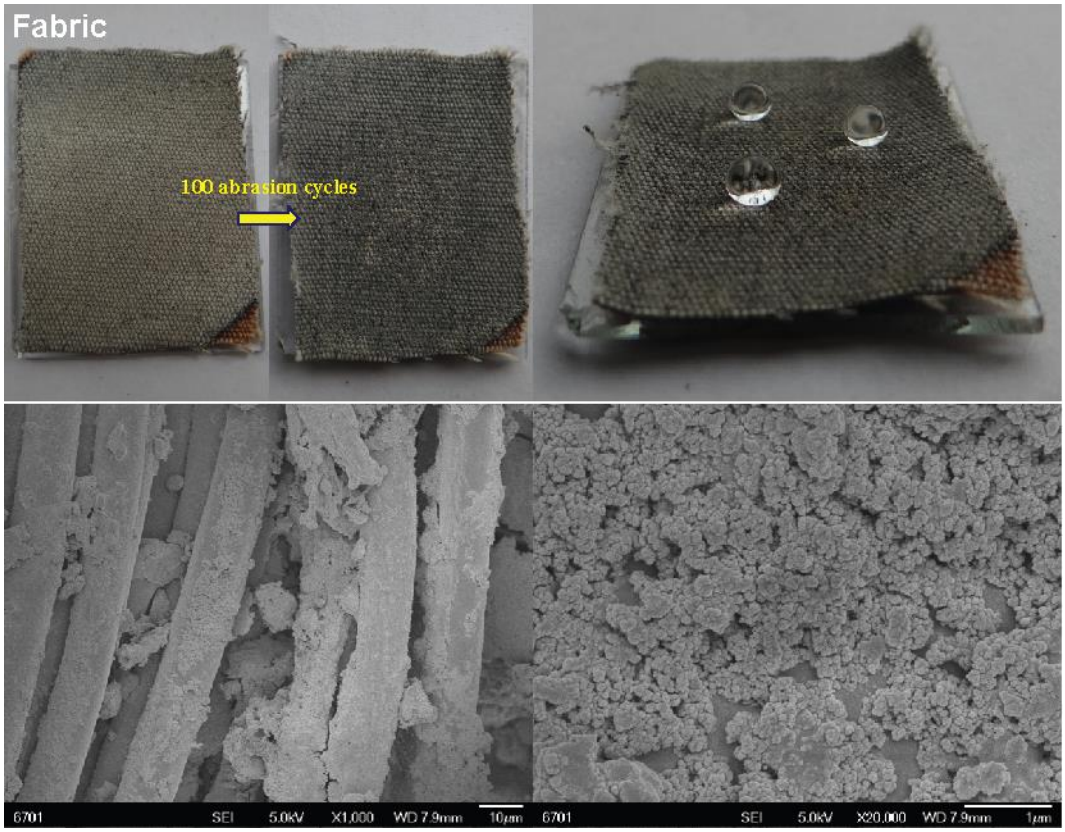


**Fig. S8** Photographs and SEM images of the coated fabric after 100 abrasion cycles.

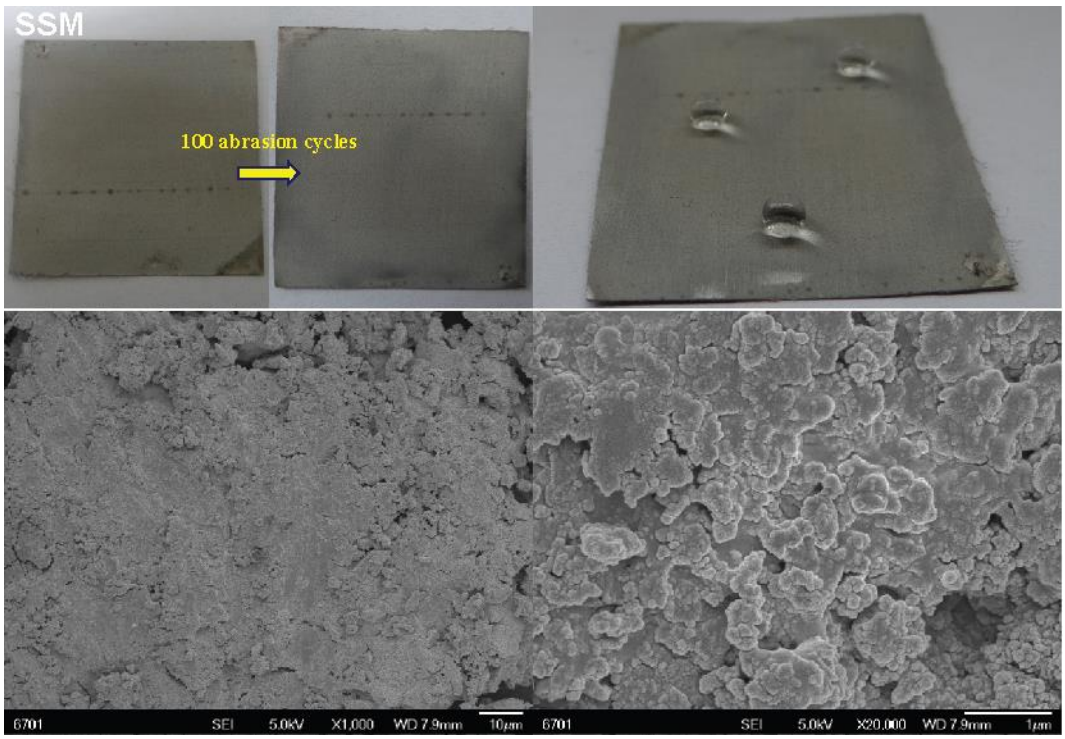

**Fig. S9** Photographs and SEM images of the coated SSM after 100 abrasion cycles.

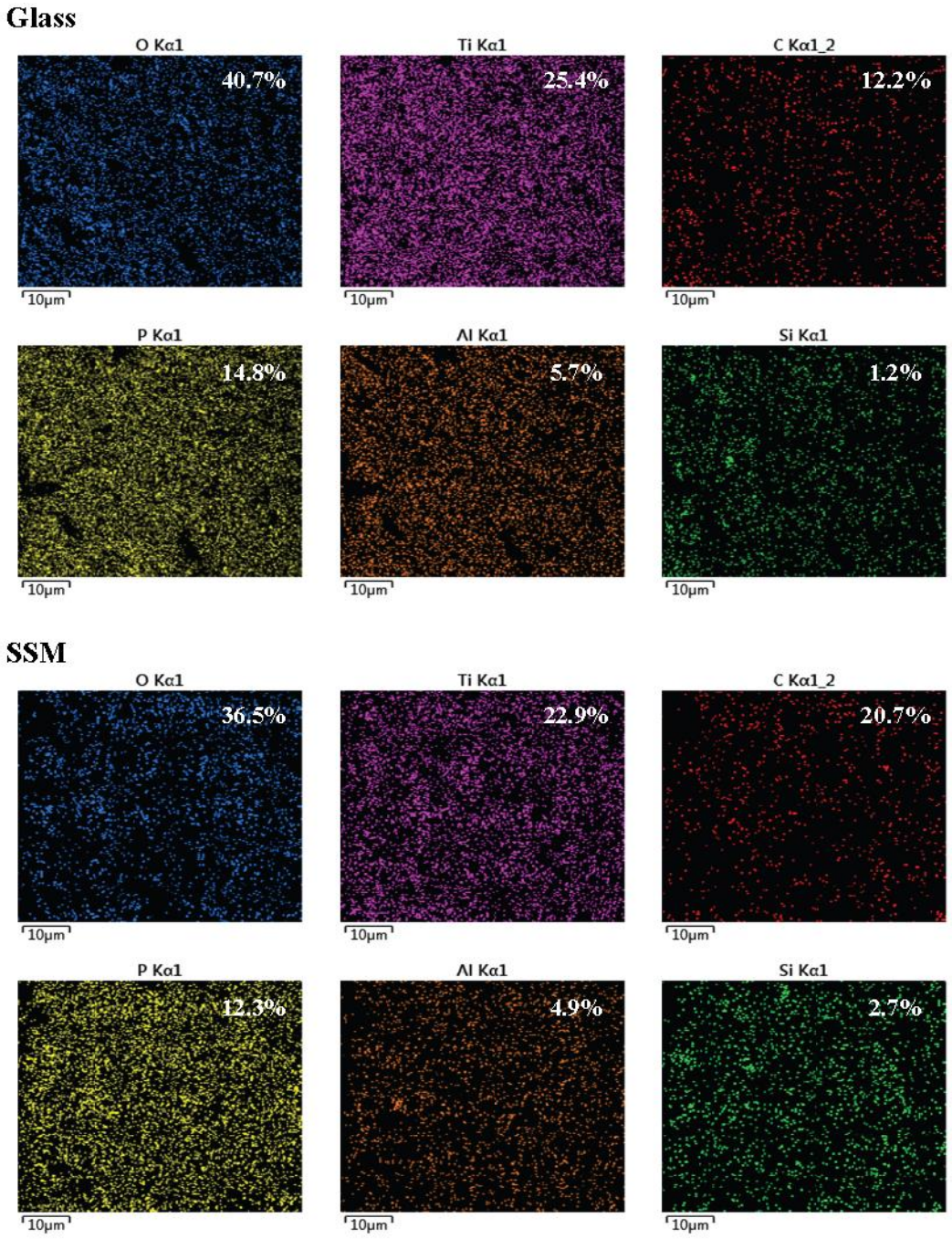


**Fig. S10** Element distribution maps of the AP-$TiO_2$@OTS coated glass and SSM after 100 abrasion cycles.

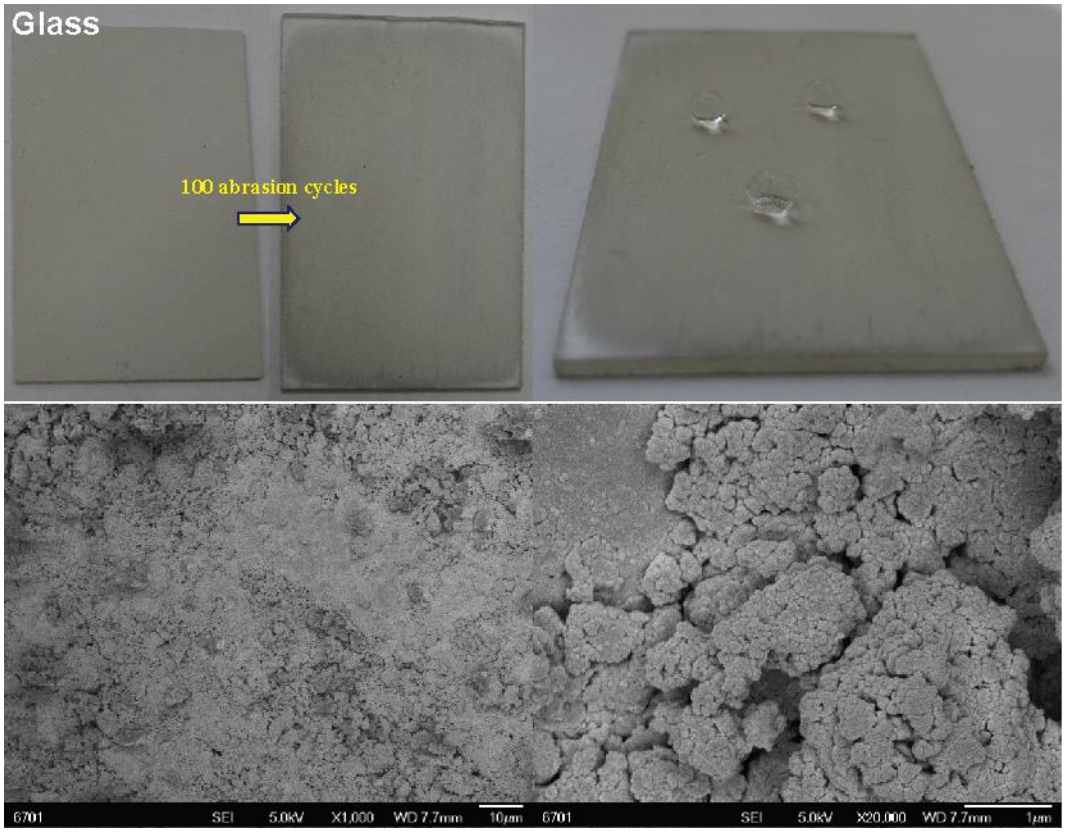


**Fig. S11** Photographs and SEM images of the AP-$TiO_2$@OTS coated glass after treatment in hot oil and then 100 abrasion cycles.

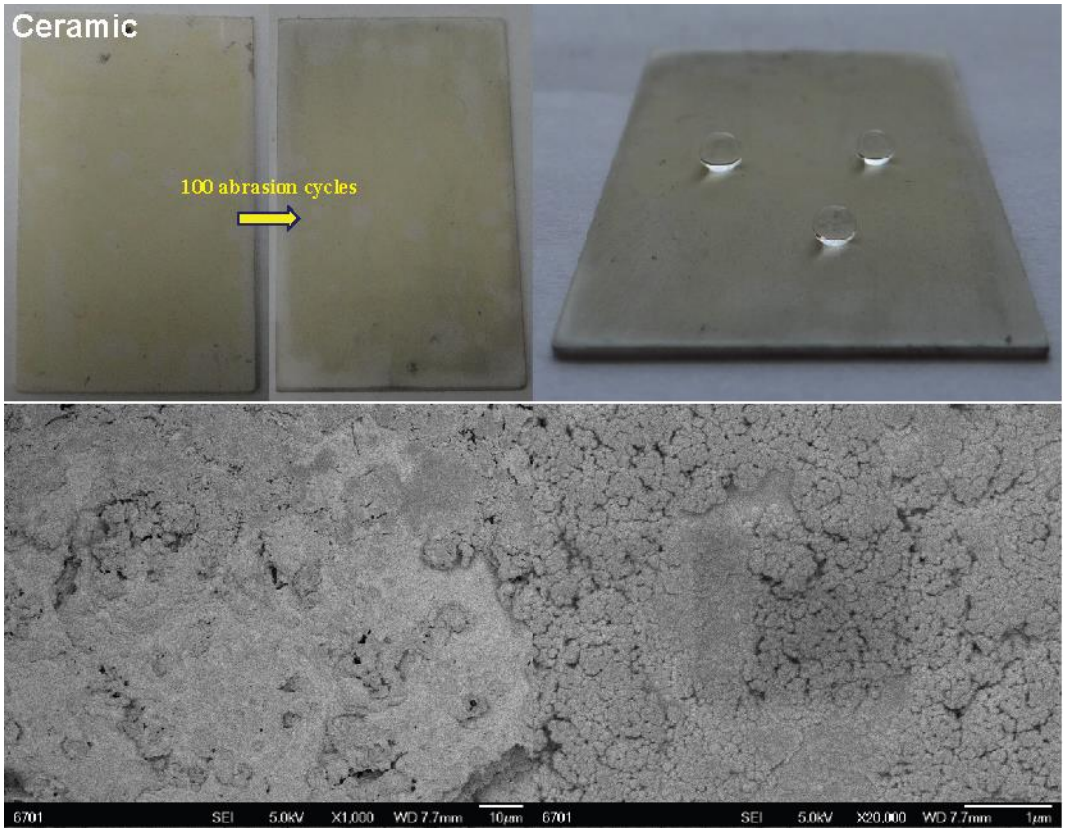


**Fig. S12** Photographs and SEM images of the AP-$TiO_2$@OTS coated ceramic after treatment in hot oil and then 100 abrasion cycles.

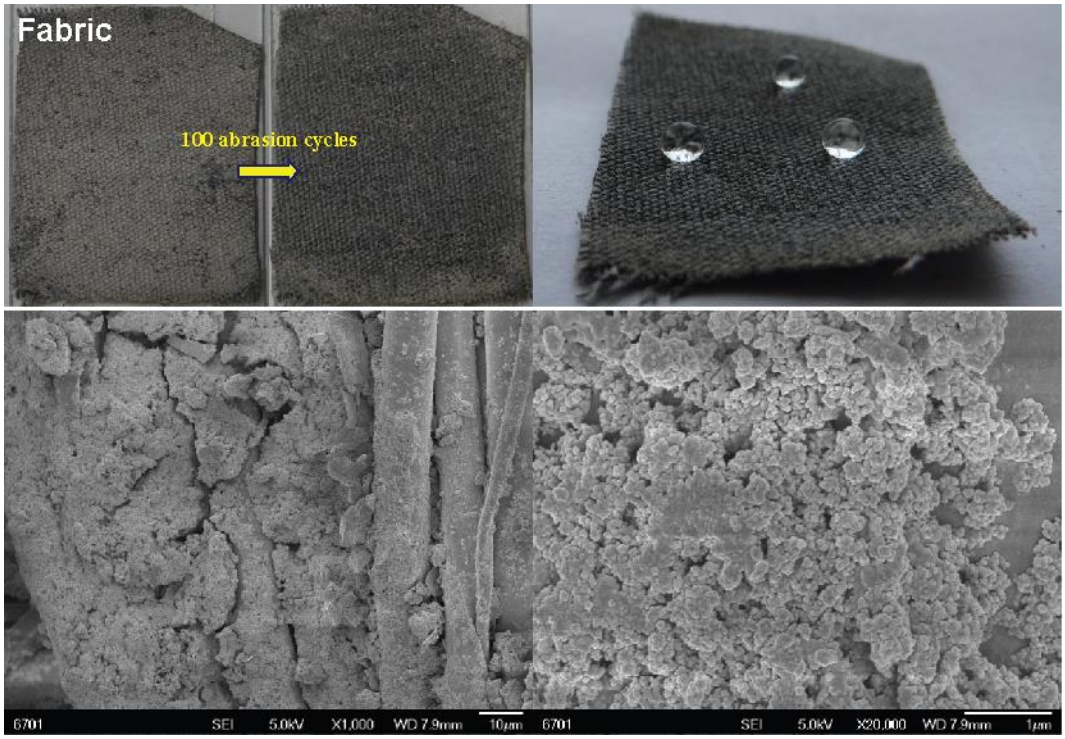


**Fig. S13** Photographs and SEM images of the AP-$TiO_2$@OTS coated fabric after treatment in hot oil and then 100 abrasion cycles.

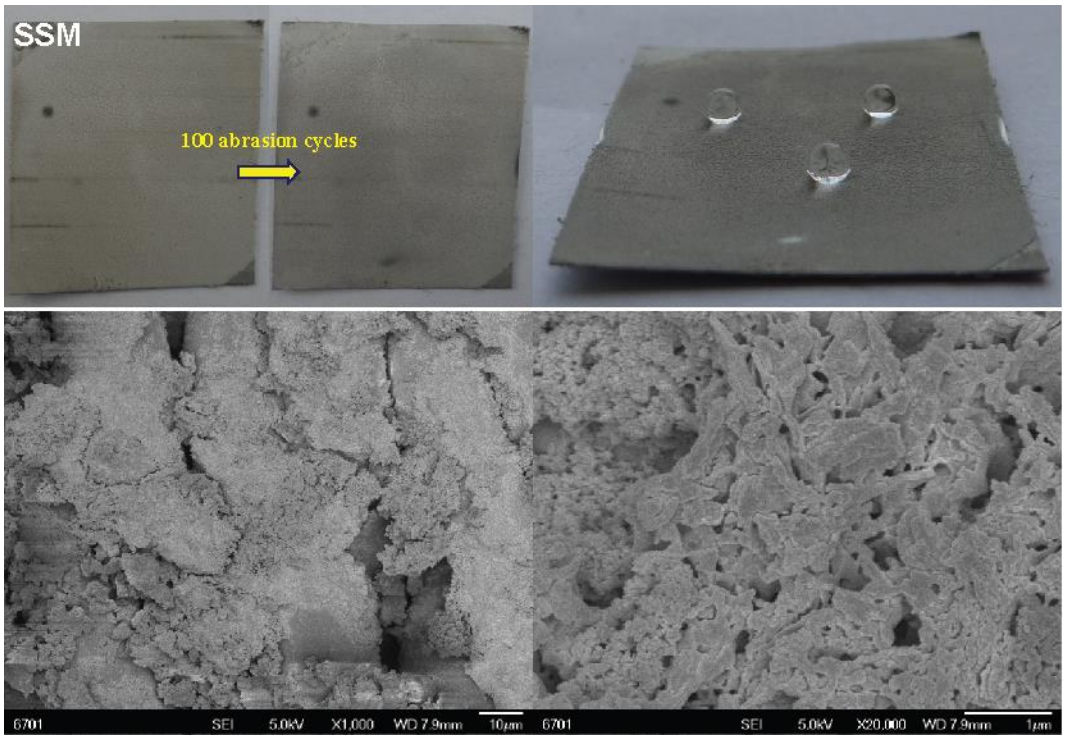

**Fig. S14** Photographs and SEM images of the AP-$TiO_2$@OTS coated SSM after treatment in hot oil and then 100 abrasion cycles.

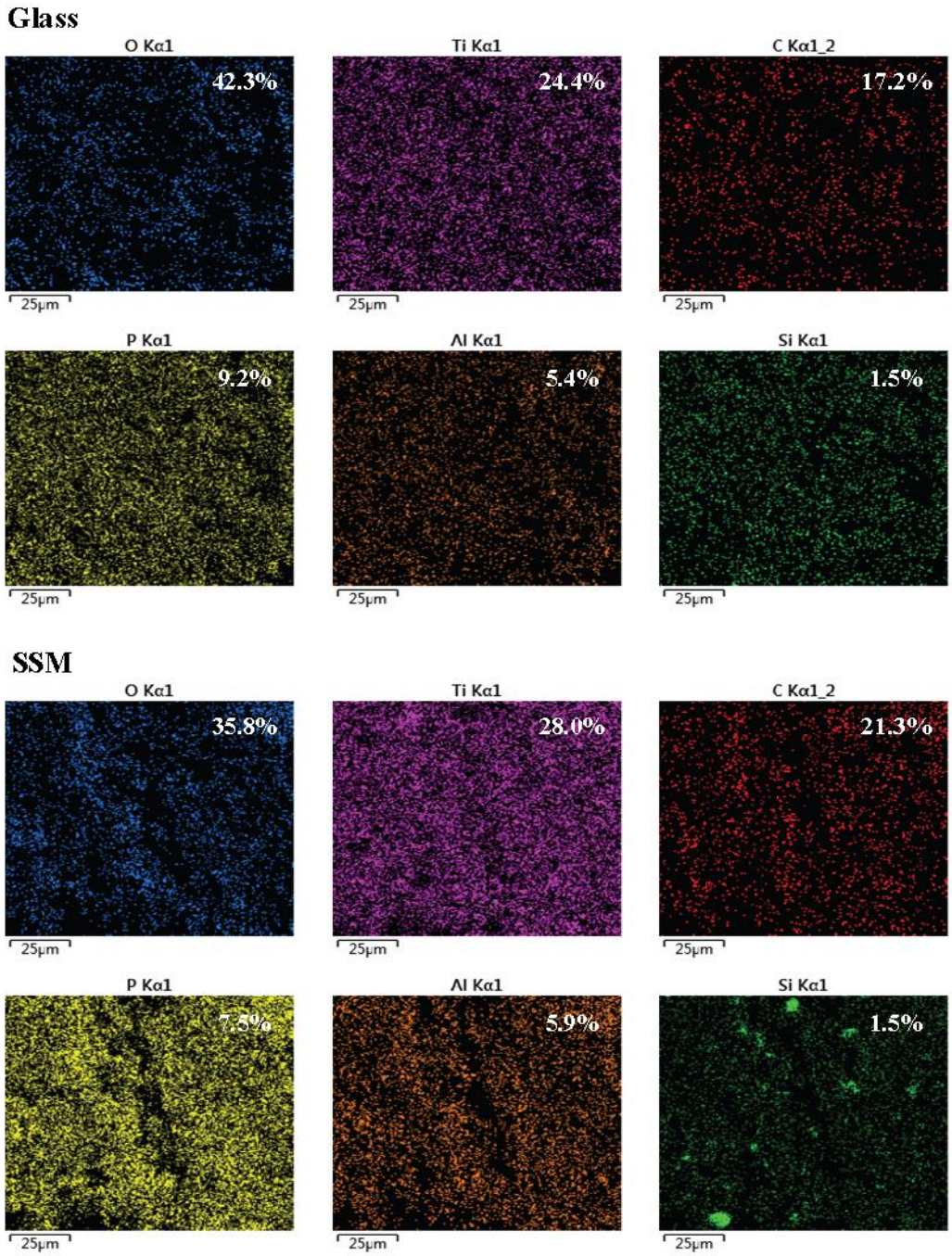


**Fig. S15** Element distribution maps of the AP-$TiO_2$@OTS coated glass and SSM after treatment in hot oil and then 100 abrasion cycles.

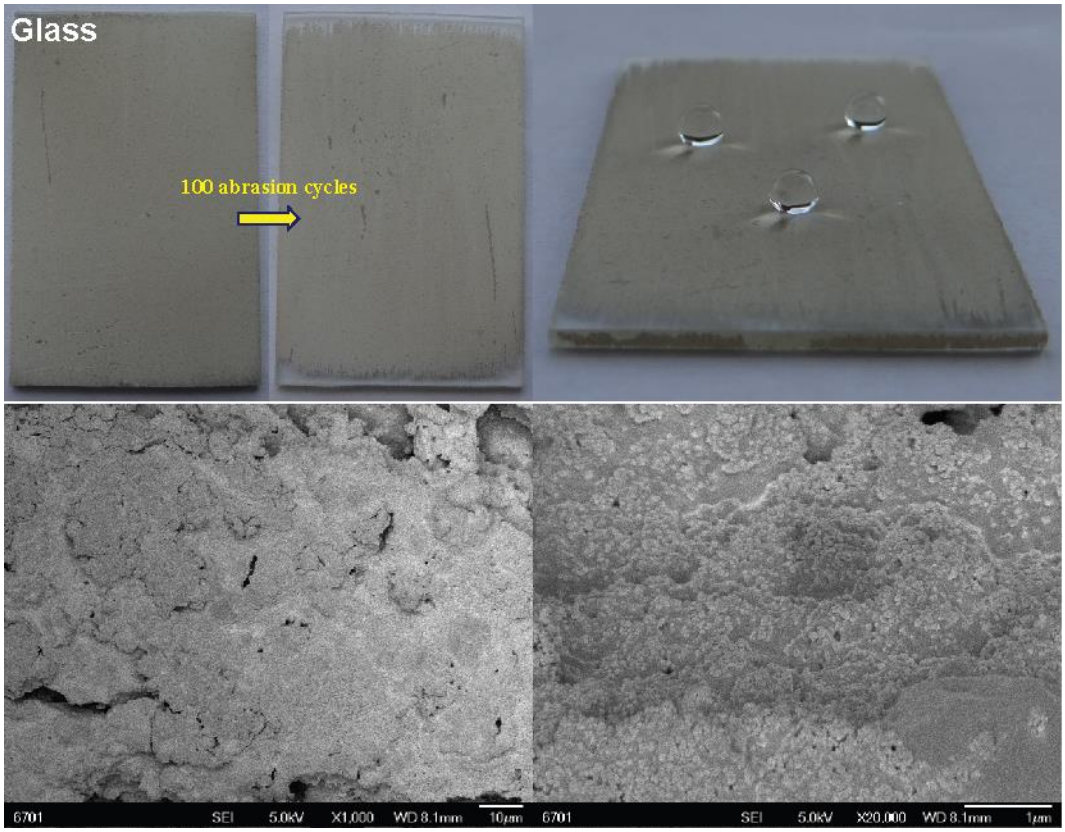


**Fig. S16** Photographs and SEM images of the AP-$TiO_2$@OTS coated glass after treatment in hot water and then 100 abrasion cycles.

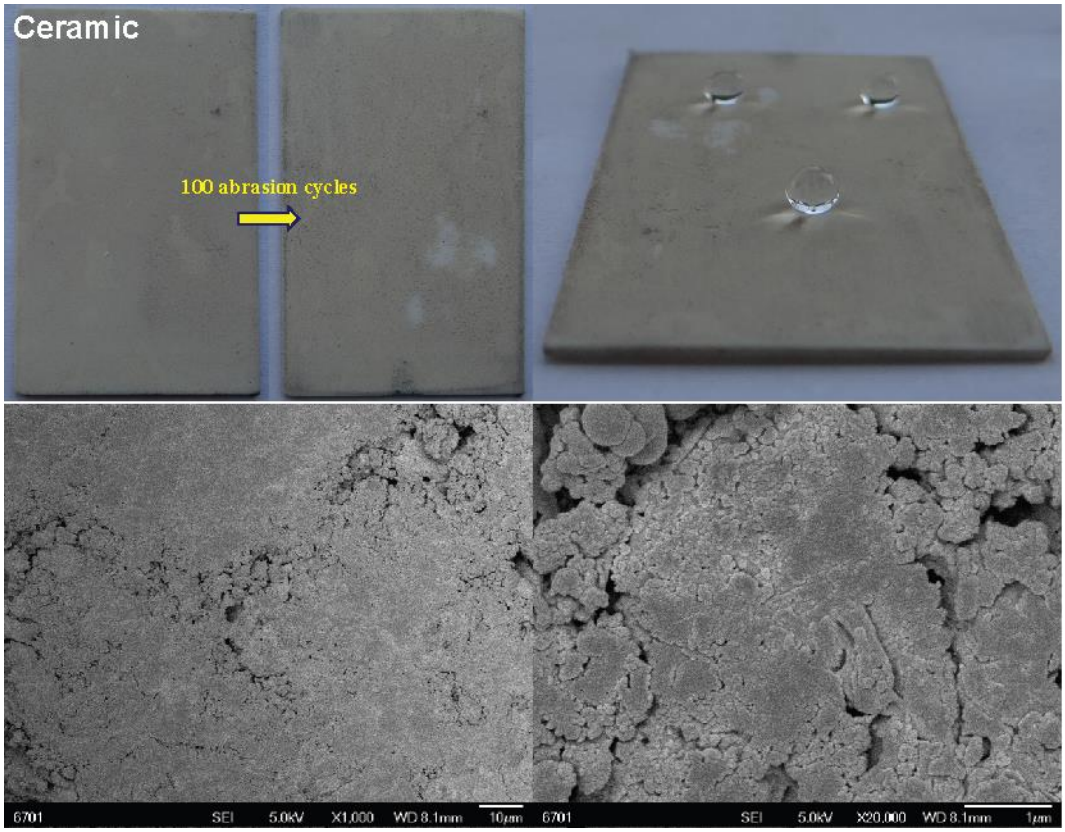


**Fig. S17** Photographs and SEM images of the AP-$TiO_2$@OTS coated ceramic after treatment in hot water and then 100 abrasion cycles.

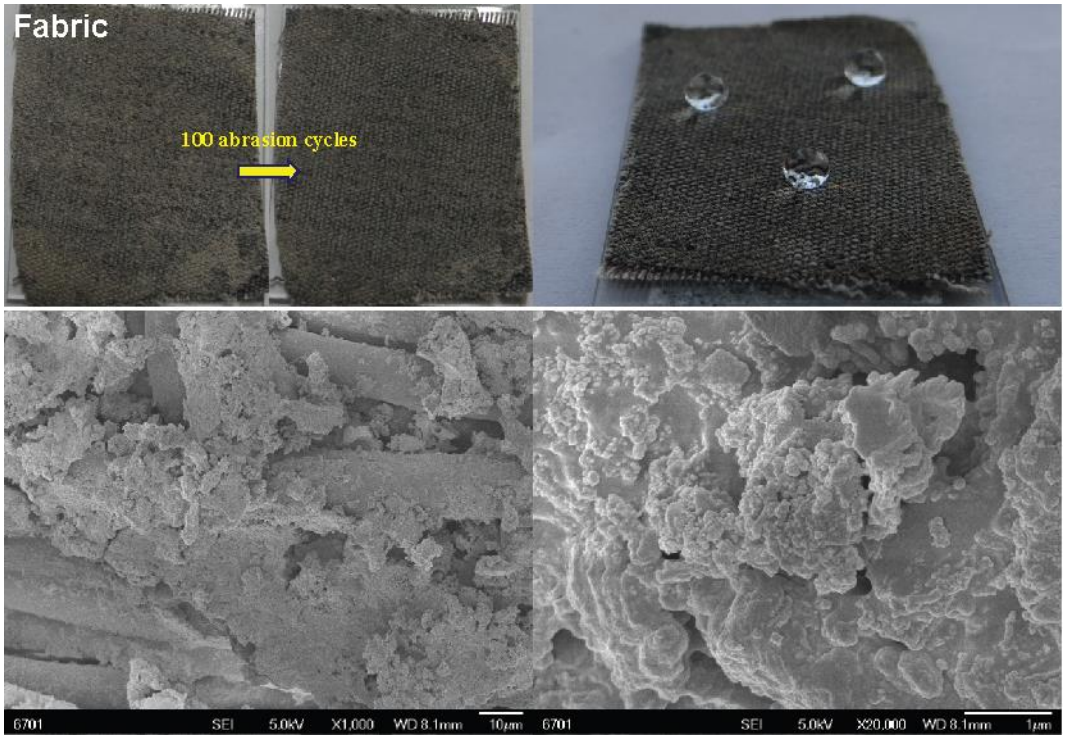


**Fig. S18** Photographs and SEM images of the AP-$TiO_2$@OTS coated fabric after treatment in hot water and then 100 abrasion cycles.

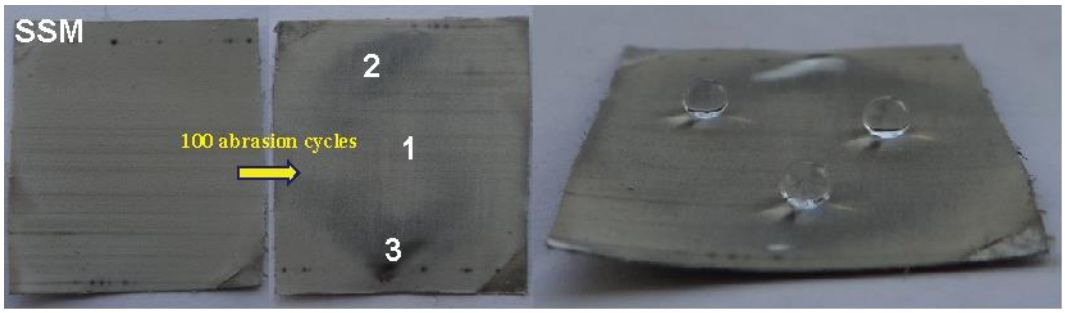


**Fig. S19** Photographs of the AP-$TiO_2$@OTS coated SSM after treatment in hot water and then 100 abrasion cycles.

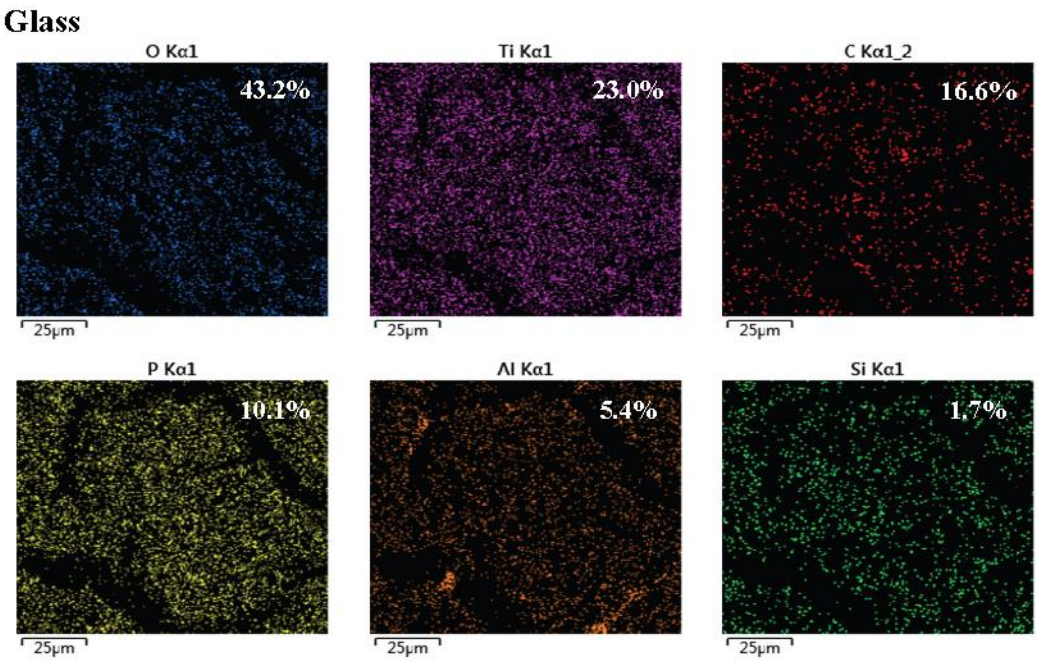


**Fig. S20** Element distribution maps of the AP-$TiO_2$@OTS coated glass after treatment in hot water and then 100 abrasion cycles.

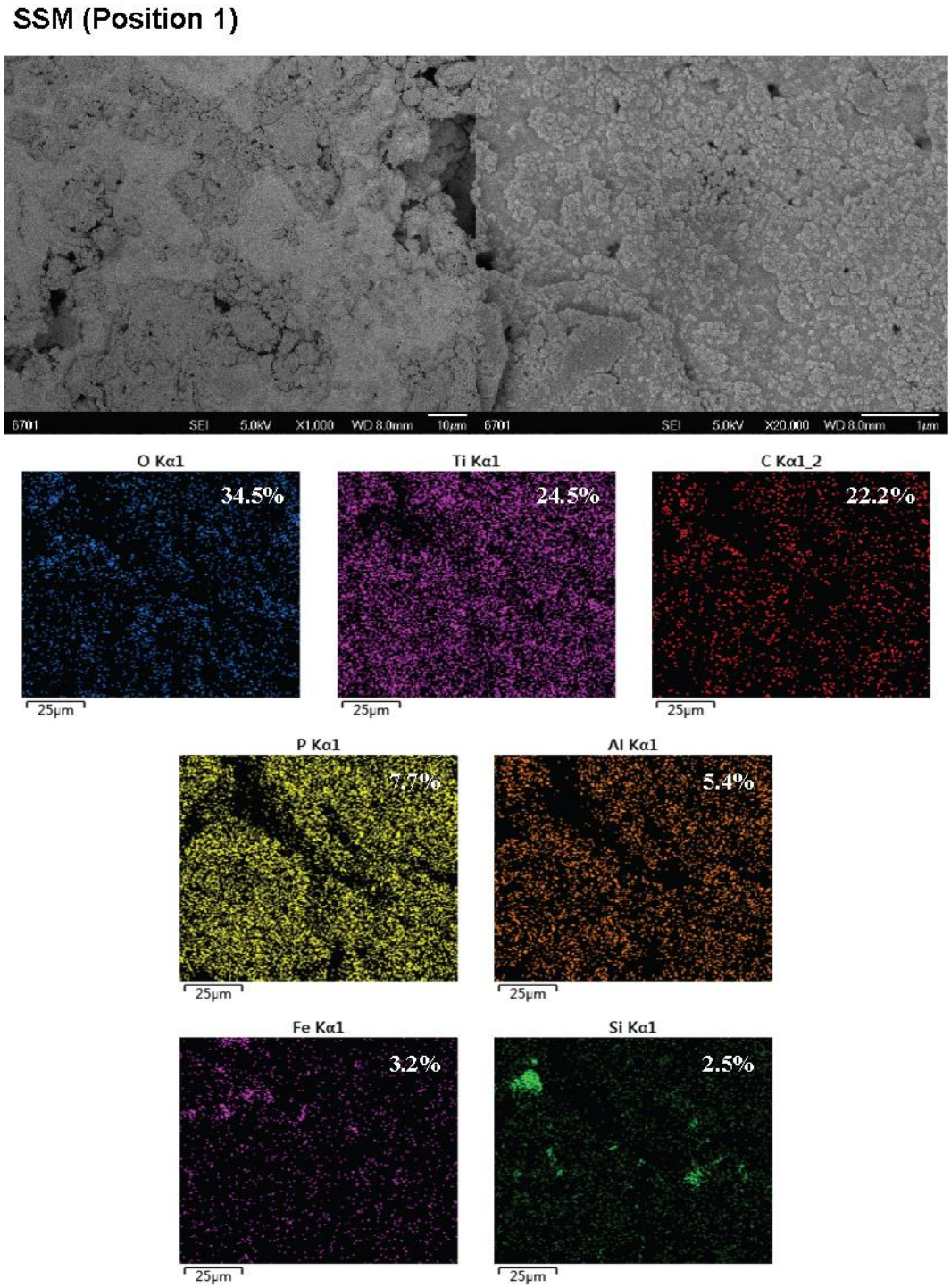


**Fig. S21** SEM images and element distribution maps of the AP-$TiO_2$@OTS coated SSM (position 1) after treatment in hot water and then 100 abrasion cycles.

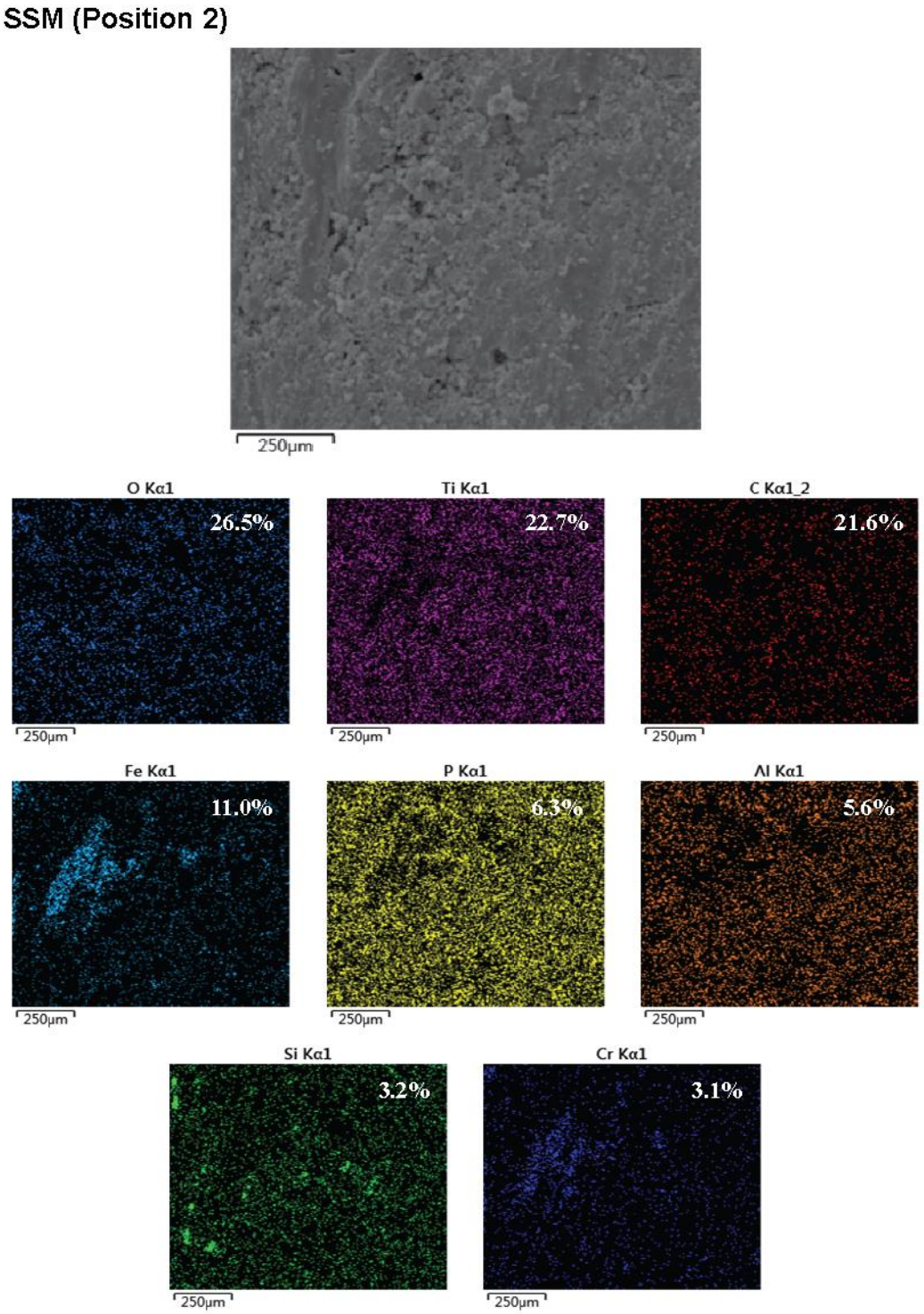


**Fig. S22** SEM images and element distribution maps of the AP-$TiO_2$@OTS coated SSM (position 2) after treatment in hot water and then 100 abrasion cycles.

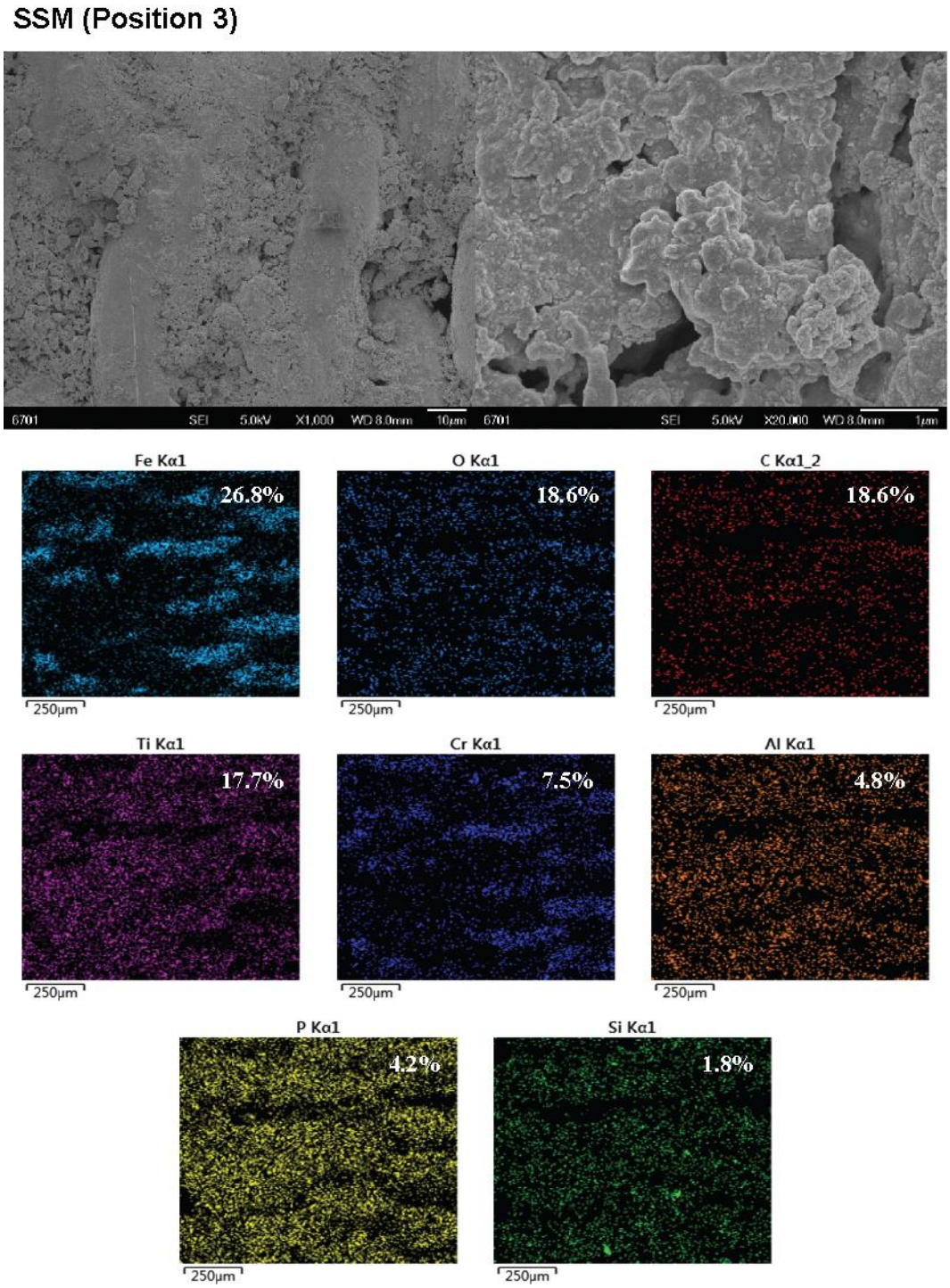


**Fig. S23** SEM images and element distribution maps of the AP-$TiO_2$@OTS coated SSM (position 3) after treatment in hot water and then 100 abrasion cycles.

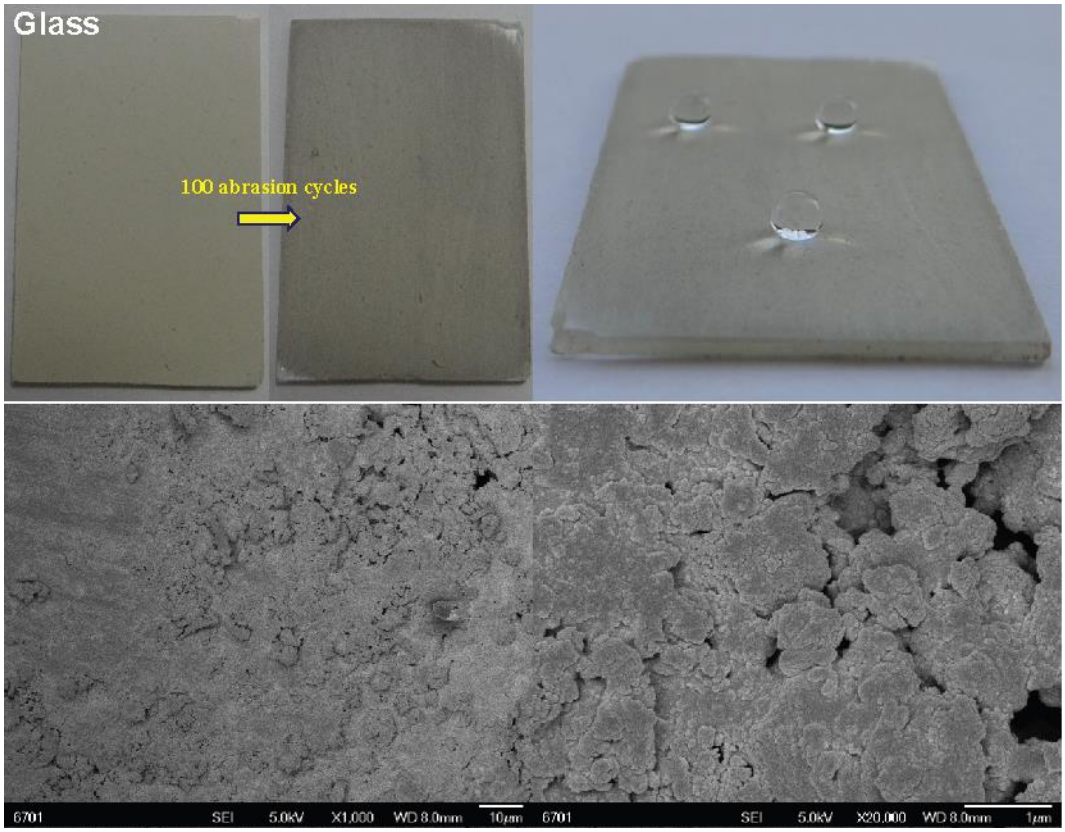


**Fig. S24** Photographs and SEM images of the AP-$TiO_2$@OTS coated glass after treatment in hot acetone and then 100 abrasion cycles.

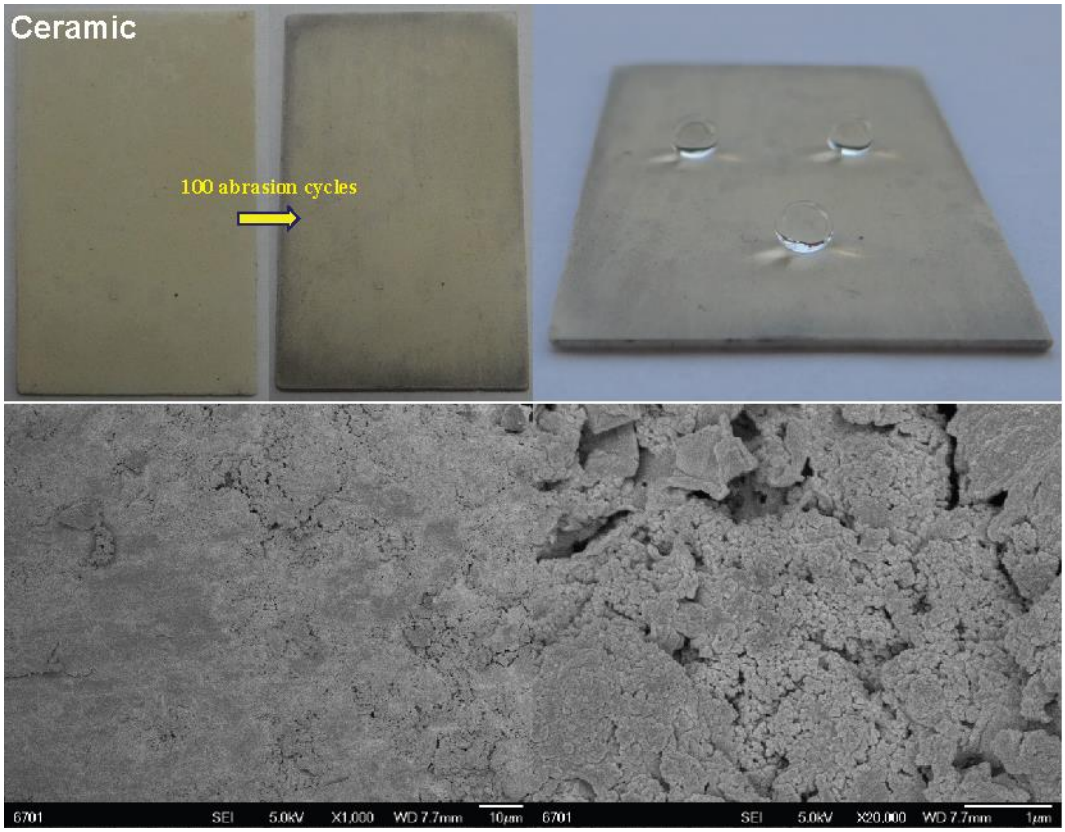


**Fig. S25** Photographs and SEM images of the AP-$TiO_2$@OTS coated ceramic after treatment in hot acetone and then 100 abrasion cycles.

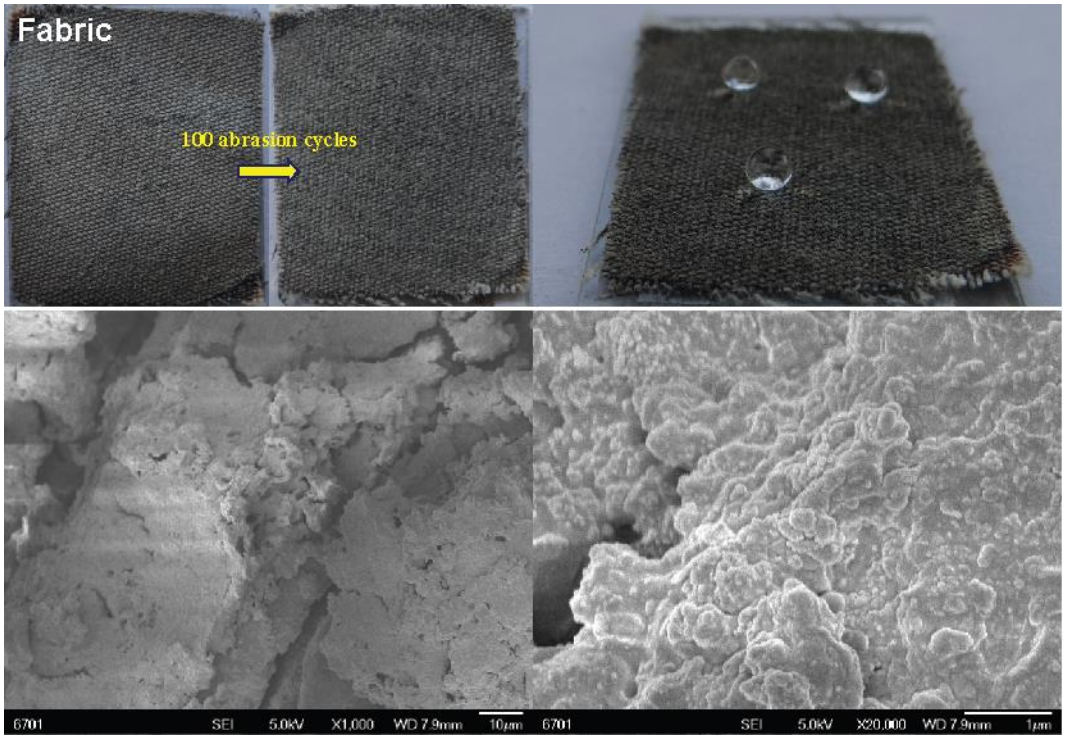


**Fig. S26** Photographs and SEM images of the AP-$TiO_2$@OTS coated fabric after treatment in hot acetone and then 100 abrasion cycles.

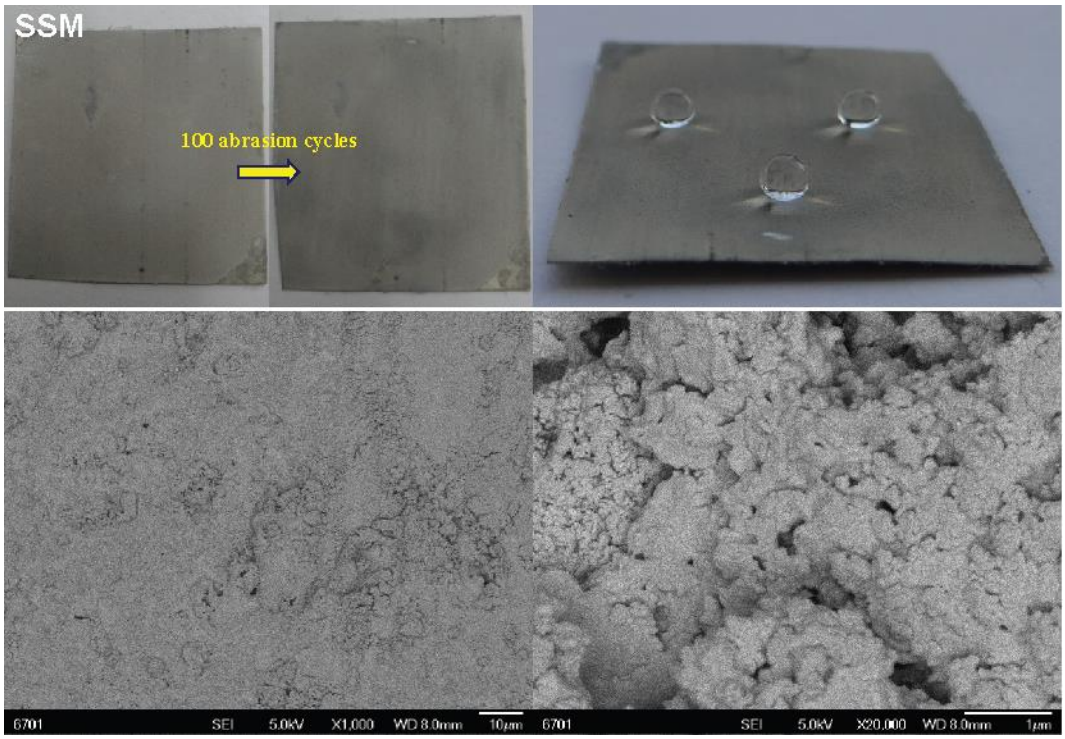

**Fig. S27** Photographs and SEM images of the AP-$TiO_2$@OTS coated SSM after treatment in hot acetone and then 100 abrasion cycles.

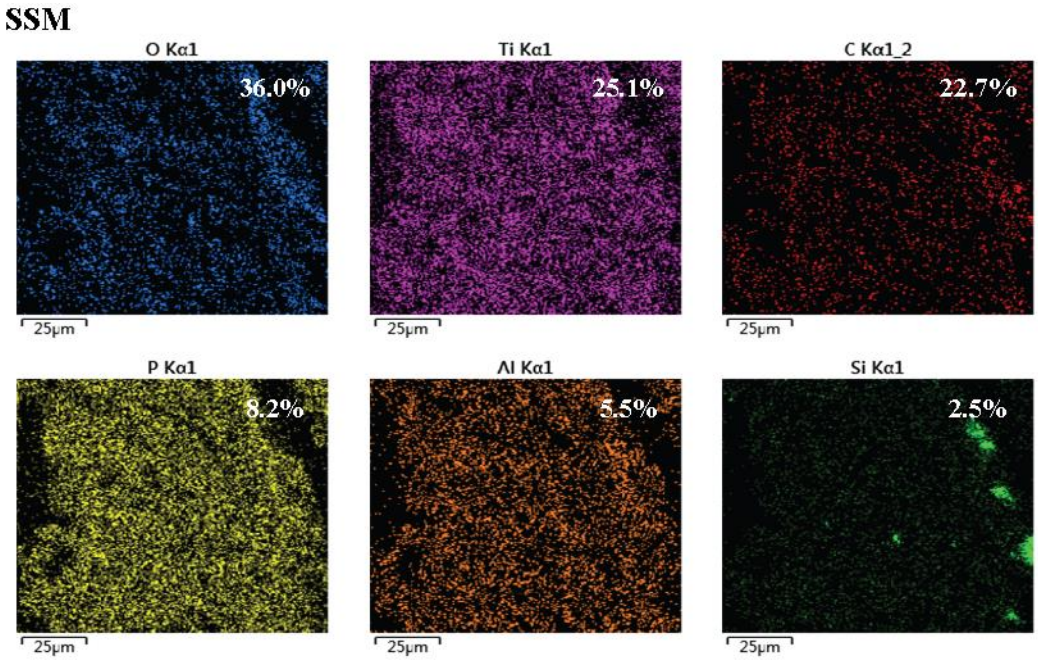


**Fig. S28** Element distribution maps of the AP-$TiO_2$@OTS coated SSM after treatment in hot acetone and then 100 abrasion cycles.

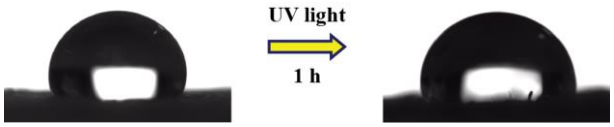


**Fig. S29** A water droplet on the surface of AP-$TiO_2$@OTS coated fabric after the Span 80 adhesion and then 1-h UV light irradiation. The intensity and wavelength of UV light are 30 W and 254 nm, respectively. The distance between the AP-$TiO_2$@OTS coated fabric and UV lamp is about 15 cm.

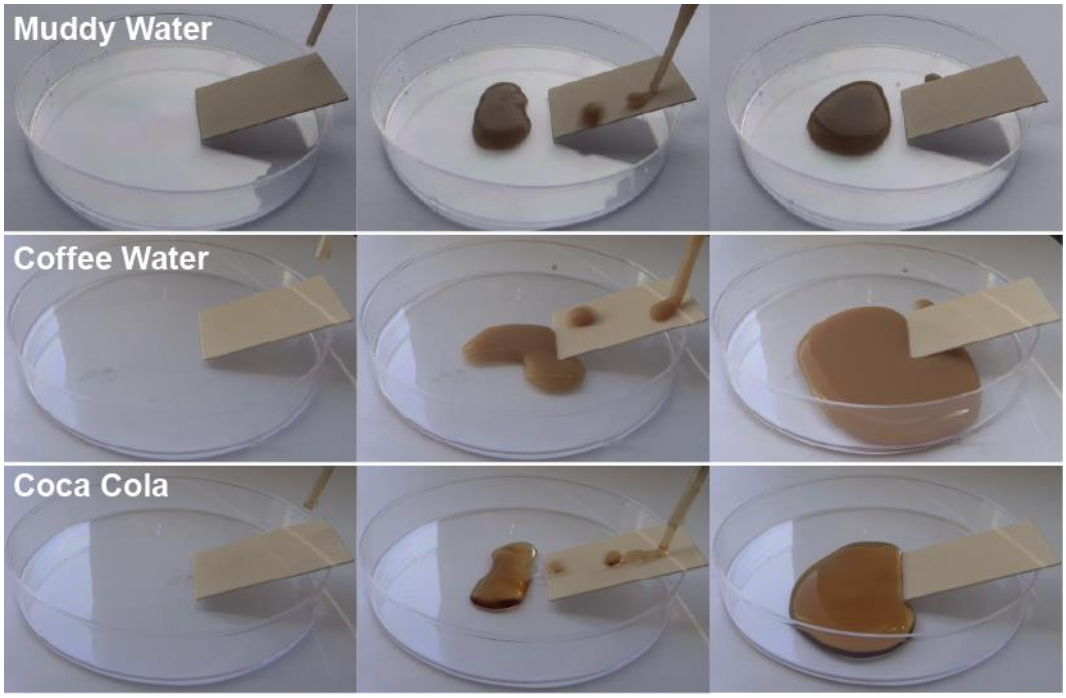


**Fig. S30** Self-cleaning process of the AP-$TiO_2$@OTS coated ceramic to repel muddy water, coffee water, and coca cola.

**Fig. S31** Photograph of the coated nickel foam (about 0.4 g) with a loading of 4 g weights.


**Fig. S32** Photographs of water-in-oil emulsions before and after emulsion separation.

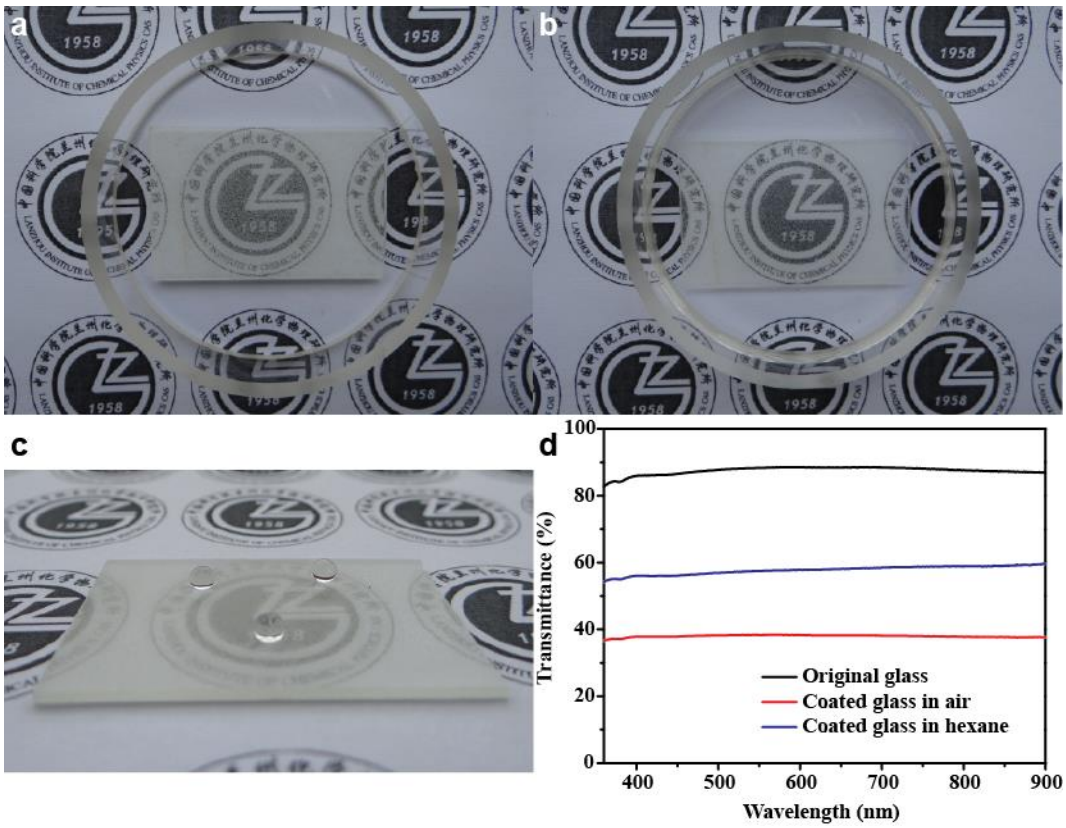


**Fig. S33** (a) Photograph of semi-transparent AP-$TiO_2$@OTS coated glass in air. (b) Photograph of semi-transparent AP-$TiO_2$@OTS coated glass in hexane. (c) Water droplets on the surface of semi-transparent AP-$TiO_2$@OTS coated glass. (d) Transmittance of original glass, semi-transparent AP-$TiO_2$@OTS coated glass in air and in hexane.

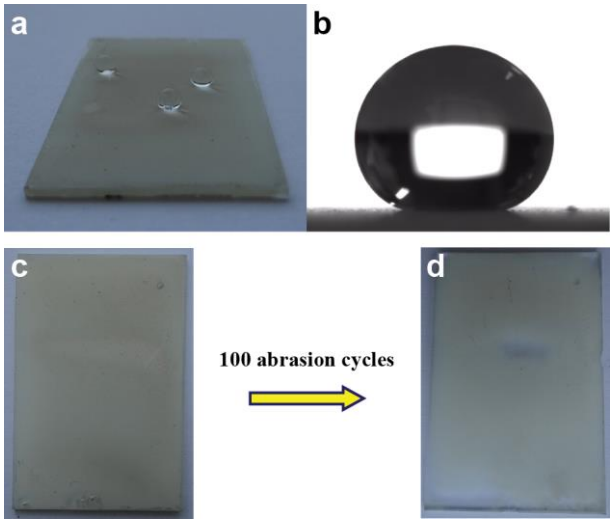


**Fig. S34** (a) Photograph of glass painted directly by the AP-$TiO_2$@OTS coating. (b) A water droplet on the surface of glass painted directly by the AP-$TiO_2$@OTS coating. (c, d) Photographs of glass painted directly by the AP-$TiO_2$@OTS coating before (c) and after (d) 100 abrasion cycles with sandpaper.

**Movie S1** A water droplet rolls down along the inclined surfaces of AP-$TiO_2$@OTS coated glass, ceramic, fabric, nickel foam, and SSM.

**Movie S2** A water droplet quickly spreads on the surface of the plasma-treated fabric.

**Movie S3** Self-cleaning process of the AP-$TiO_2$@OTS coated ceramic to repel muddy water, coffee water, and coca cola.

**Movie S4** Oil-water separation process using AP-$TiO_2$@OTS coated fabric.