Supporting Information

Rapid Fabrication of Robust, Washable, Self-Healing Superhydrophobic Fabrics with Non-iridescent Structural Color by Facile Spray Coating

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Movie S1 about experimental process of fabrication coated fabrics color by spray coating. The solution was the concentration of 10 wt% P(St-MMA-AA) composite NPs with diameters of 294 nm, and the substrate was black plain weave fabric. The solution was air-sprayed onto a black plain cotton fabric approximately 10 cm far from the exit of the 0.2 mm spraying nozzle. It was carried out under a gas pressure of 50 kpa. The black fabric gradually turned into red in 20 seconds.

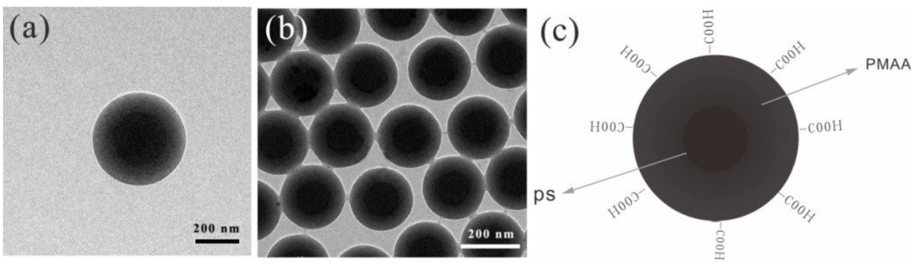


Figure S1: a) and b) TEM image of the P(St-MMA-AA) NPs. c) Schematic diagram of the P(St-MMA-AA) NPs.

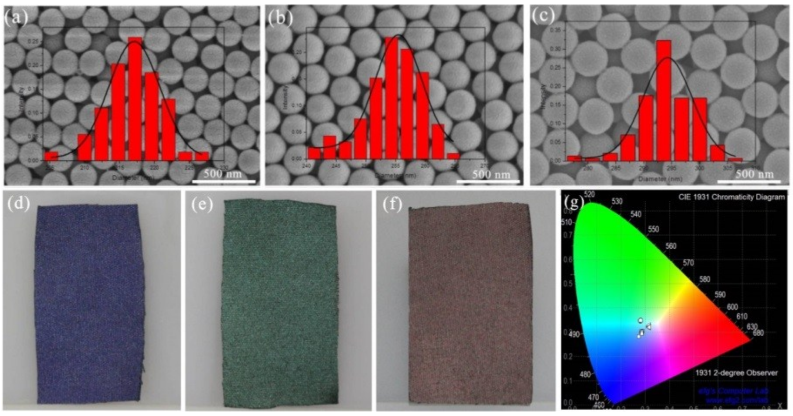


Figure S2: a)-c) SEM image and particle size distribution of the P(St-MMA-AA) NPs. d)-f) Optical images of spray coated fabrics with nanoparticle diameter of 217nm (d), 257nm (e), and 294 nm (f), respectively. g) The different reflection colors of the nanoparticles in Commission Internation de I’ Eclairage (CIE) chromaticity values: square (voilet), circle (green) and triangle (red).

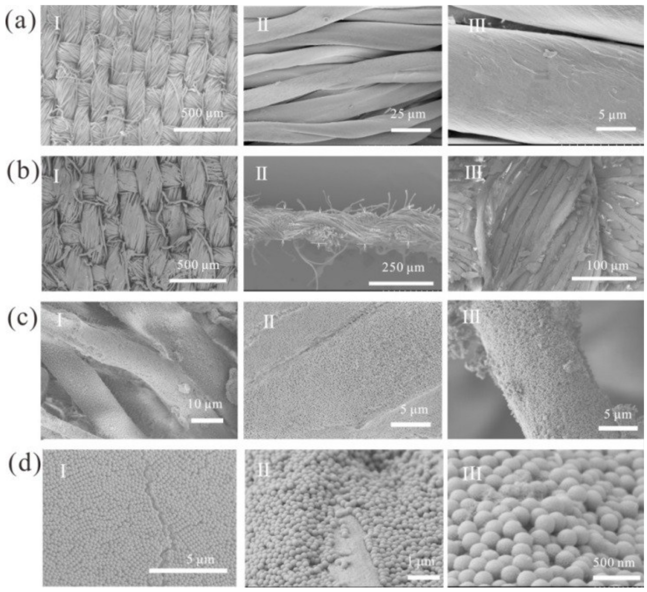


Figure S3: aⅠ)-aIII) The surface morphology of original fabric and fibers. bⅠ)-bIII) The surface and section morphology of the coated fabric. cⅠ)-cIII) The particles were attached on the surface of each fiber. d) Array of the particles on the fibers.

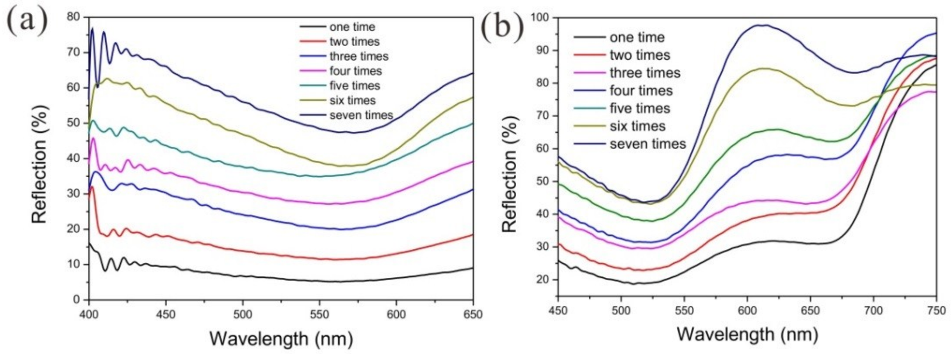


Figure S4: Reflectance spectrum of the violet a) and red b) coated fabrics with different spraying times.

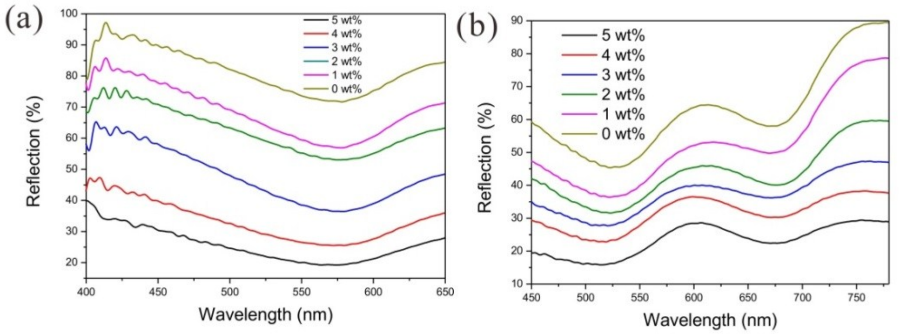


Figure S5: Variation diagram of color saturation of violet c) and red d) coated fabrics.

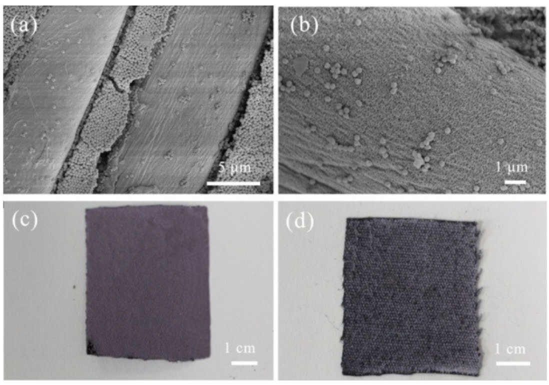
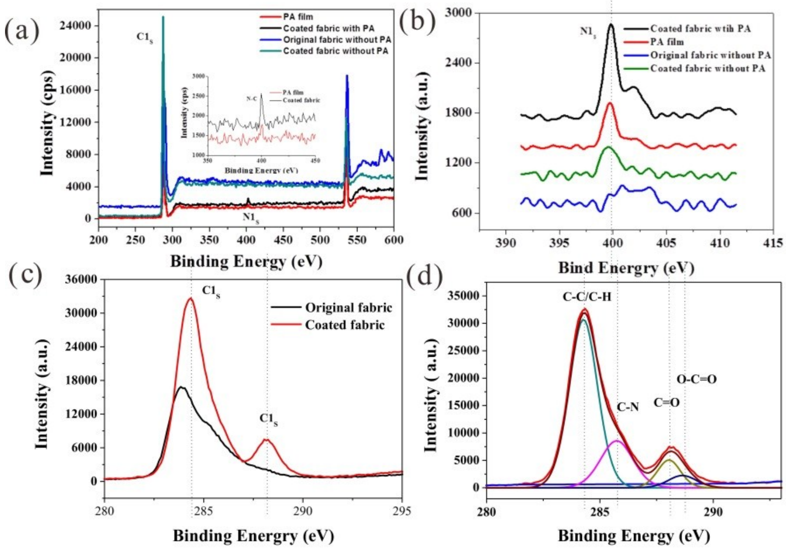


Figure S6: a), b) Particles on the coated fabrics without incorporation of PA nearly fell off the fiber surface after a cycle. c), d) Without incorporation of PA, the fabric was fade badly after a laundry cycle (left: before washing, right: after washing).



Movie S2 about the control sample. The pristine cotton fabric demonstrated hydrophilic behavior due to the presence of abundant hydroxyl groups on the surface of their cellulose fibers, strong capillary effect caused by the cotton fibers and the hollow space within the fabric.

Figure S7: XPS results of the spray coated fabrics with and without PA, PA film, original fabric.

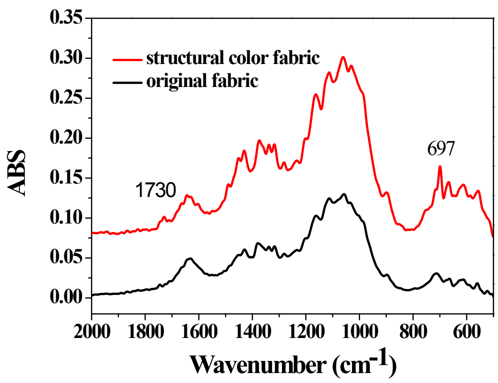
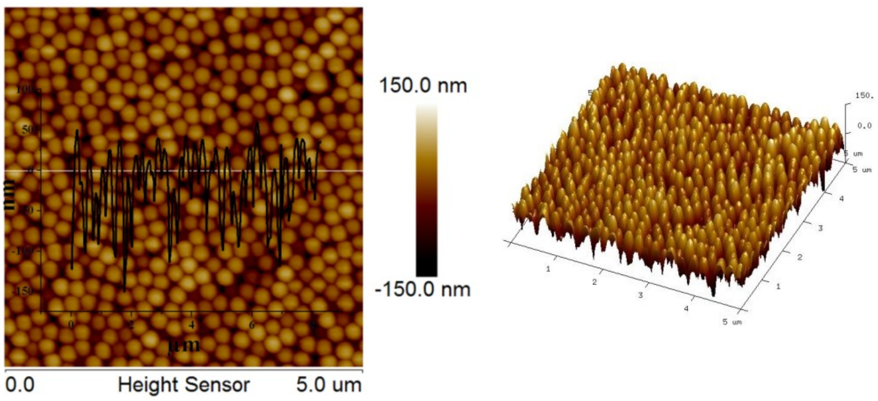


Figure S8: The characteristic absorbance bands of carboxyl group (1727 cm^{-1}) and benzene group (697 cm^{-1})



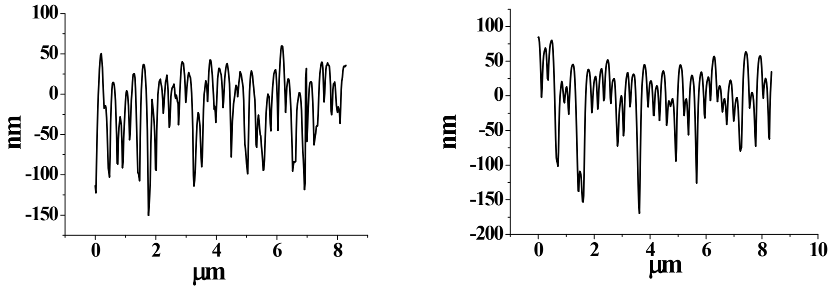


Figure S9: Images recorded surface of coated fiber by using atomic force microscopy (AFM). The average fluctuation of surface of coated sample in x (left) and y (right) direction.

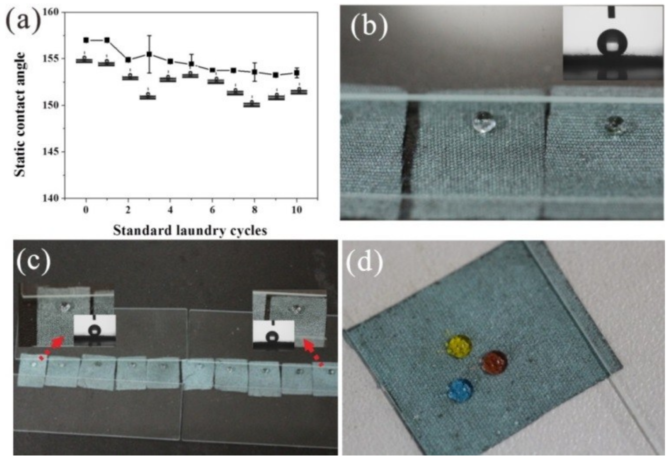


Figure S10: a) The water CA of the coated fabric after 10 cycles of standard machine laundry. b) Optical image of the superhydrophobic coated fabrics. c) The coated fabrics maintained superhydrophobicity after 10 cycles of standard machine laundry. d) Three 6 µl water droplets coloring with different dyes became spherular.

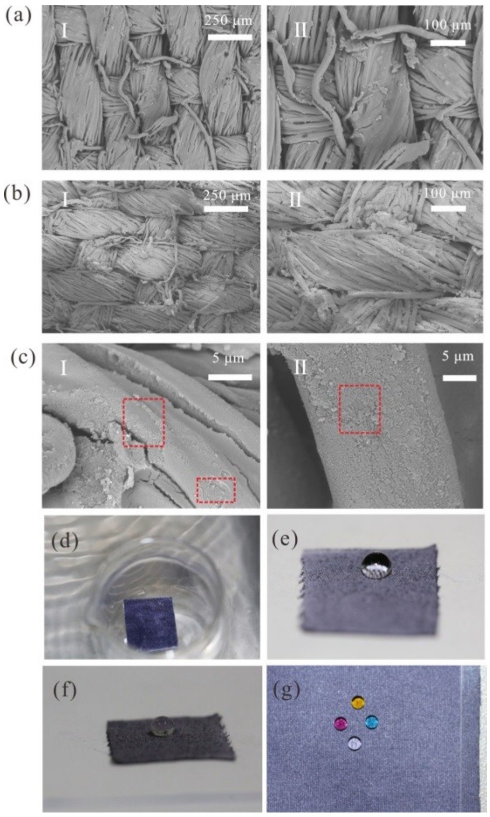


Figure S11: The SEM of supersonic vibration treated fabrics and optical image of superhydrophobic coated fabric after ultrasonic washing. a Ⅰ)and a Ⅱ)SEM images of original coated fabrics. b Ⅰ) and b Ⅱ)SEM images of coated fabrics treated by ultrasonic washing. c Ⅰ) and c Ⅱ) Morphology of fibers after supersonic washing.. d) The process of supersonic washing. e)-g) Optical images of superhydrophobic coated fabric at different angle view.

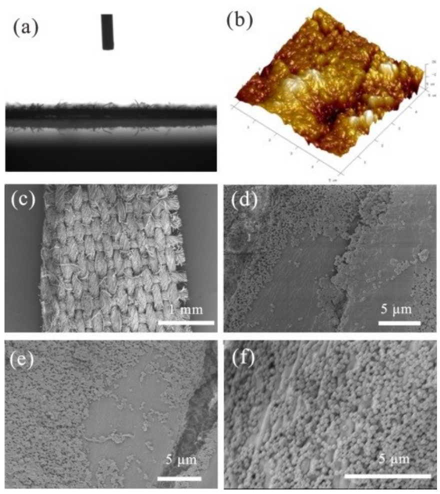


Figure S12: a) Static contact angle of the fabics and b) the AFM Image of coated fabrics by plasma treatment. c) Morphology of coated fabrics by plasma treatment. d)-f) Most of particles fell off the fibers by plasma treatment.