## Supporting Information

Succinylation of wool fibers was conducted in DMF containing 10% w/v succinic anhydride at 65°C for 2h.[14] In a typical procedure, fibers were first cleaned by non-ionic detergent (Kieralon OL) at 45°C for 30min to remove impurities prior to modification. 2g of cleaned wool fibers were added to 50mL of a 10% w/v solution of succinic anhydride in DMF. The mixture was stirred at 65°C for 2h. The fibers were washed with DMF and then with plenty of water to remove any unreacted succinic anhydride and finally oven-dried at 60°C for 10min.

Nanosized $TiO_2$ colloid T60 was prepared following a modified procedure wherein nitric acid was replaced by hydrochloric acid.[4] In a 250mL beaker, 80mL water, 20mL ethanol, 20mL acetic acid, and 1mL nitric acid were mixed and stirred rapidly. To these, 5mL titanium tetraisopropoxide (TIP) were added while stirring. The formed white suspensions were heated at 60ºC while vigorously stirred for 16h and then cooled to room temperature prior to use. The succinylated samples were dipped in the anatase colloid T60 at room temperature for 1min, dried at 60°C for 5min, and cured at 120°C for 3min.

Fourier Transform Infrared spectroscopy with Attenuated Total Internal Reflectance (FTIR-ATR) mode measurement: IR spectra ($4cm^{-1}$ resolution, 128 scans) were recorded on Perkin-Elmer 2000 FTIR spectrometer using attenuated total internal reflectance reflection mode with zinc selenide crystal.

Scanning Electron Microscopy (SEM): The surface morphology of samples were analyzed by field emission scanning electron microscopy (FESSEM; Model JSM-6335F, JEOL, Tokyo, Japan), operating at 5.0kV accelerating voltage.

X-ray Photoelectron Spectroscopy: The elemental composition of samples was analyzed by X-ray photoelectron spectrometer, SKL-12, modified from VG CLAM 4 MCD Analyzer. The pressure inside the ion-pumped sample analysis chamber was $8x10^{-8}$ Pa with an Al Kα X-ray source.

The study of photodegradation of red wine stains under light irradiation: Irradiation of stained samples was carried out in the cavity of a Suntest solar simulator (Xenotest Alpha LM, Heraeus Industrietechnik, Germany) with irradiance of $45mWcm^{-2}$.

The study of decomposition of colorants under UV irradiation: 2.5g of each sample were cut into 1cm x 1cm pieces and placed in beakers containing 50ml methylene blue aqueous solution ($0.005gL^{-1}$) respectively, and then exposed to UV irradiation by Philip UV lamps operating at 20V with 1.2-1.3 $mWcm^{-2}$ light intensity with vigorous shaking subsequent to establishing absorption-desorption equilibrium. The colorant solution was centrifuged to precipitate the fibers so that a clear colorant solution was obtained. UV-Vis spectrometer (Perkin Elmer UV-Vis Spectrometer Lambda 18) was employed to record the absorption spectra. The photodegradation was studied by monitoring the absorbance of the colorant at 660nm.