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Innovative self-cleaning and antibacterial cotton textile: no water and no detergent for cleaning

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ABSTRACT

In study, morphologically well-defined TiO_2 nano particles (NPs), prepared by sol-gel method was coated on the cotton textile surface to develop self-cleaning, UV blocking and antibacterial cotton textile surfaces. Commercially available Degussa P25 TiO_2 powder photocatalyst was used as benchmark for comparison. To evaluate the self-cleaning action of modified textile fabric, tea stains were introduced on the cotton fabric. Under sun-test illumination, decrease in the color of tea stain was followed over time for the determination of self-cleaning performance of the modified textile surface. The effects of TiO_2 treatments on the main functions of cotton fabric were investigated by the measurements of tensile strength, tear strength, wrinkle recovery angle and color fastness measurements. The modified cotton textiles with TiO_2 NPs and Degussa P25 TiO_2 powder showed strong self-cleaning performance under illumination and tea stain was completely removed in 30 min. TiO_2 coating improved UV protection factor of cotton textile by three fold. According to the untreated cotton textile, the modified textiles with sol-gel based TiO_2 NPs and TiO_2 powder showed much stronger antibacterial performance against *E. coli* and *S. aureus* bacteria.

Keywords: Antibacterial; Cotton textile; Nano particles; Self-cleaning; Titanium dioxide

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