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

Sema Palamutcu*, Gülümser Acarb, Ahmet Hilmi Çona, Tuğçe Gültekinb, Burcu Aktanc, Hüseyin Selçukc,*

aFaculty of Engineering, Department of Textile Engineering, Pamukkale University, 20070 Kinikli, Denizli, Turkey
bFaculty of Arts and Sciences, Department of Biology, Pamukkale University, 20070 Kinikli, Denizli, Turkey
cIstanbul University, Engineering Faculty, Environmental Engineering Department, 34320, Avcilari-Istanbul, Turkey, Tel. +90 212 4737051/17720; email: hselcuk@istanbul.edu.tr

Received 4 March 2010; Accepted 15 June 2010

ABSTRACT

In study, morphologically well-defined TiO2 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 TiO2 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 TiO2 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 TiO2 NPs and Degussa P25 TiO2 powder showed strong self-cleaning performance under illumination and tea stain was completely removed in 30 min. TiO2 coating improved UV protection factor of cotton textile by three fold. According to the untreated cotton textile, the modified textiles with sol-gel based TiO2 NPs and TiO2 powder showed much stronger antibacterial performance against E. coli and S. aureus bacteria.

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

*Corresponding author.

Presented at the International workshop on urbanisation, land use, land degradation and environment (ULE 2009), 28 September – 1 October 2009, Denizli, Turkey