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New approach to UV-blocking treatments for textile and their application in apparel design.

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List of Designs and applications

Summary

Traditionally, textiles primary functions are considered; protection, modesty, providing microclimate and good look. Therefore, many attempts have been made to impart more functional characteristics to them in addition to their primary functions, so as to get what are known as multifunctional textiles. Human exposure to ultraviolet radiation has increased

in recent years due to altered leisure habits and to higher overall levels of ultraviolet (UV) radiation caused by the decreased ozone content of the atmosphere. Therefore there is strong demand for means of providing ultraviolet shielding properties to human and textiles, science they play an important role as they are directly applied to the skin.

The present thesis aims to impart ultraviolet blocking as well as antibacterial properties to four fabrics with different natures and constructions against the harmful ultraviolet radiation, as well as using these different textile fabrics in performing fashionable summer apparel products. The production of these articles aims to produce high-value-added to the fabrics and to create attractive designs. In order to fulfill the goals, the following steps were done:

1. Woven cotton, knitted Rip, knitted Pique and woven viscose/polyester fabrics were selected, taking into account the availability in the Egyptian market in addition to their obtainable prices.

2. The titanium hydrosol was prepared using titanium isopropoxide (TIP) as a precursor at low temperature via sol-gel approach.

3. The previous fabrics were subjected conventional coating using the prepared sol, with varying coating conditions.
4. The prepared nanosol was investigated by Transmission electron microscopy (TEM); while the fabric surfaces have been investigated by scanning electron microscope (SEM) and Fourier transform infrared (FTIR). Images revealed a uniform and continuous structure of the coating layer. The image of tested sol revealed that it containing nano particles that are spherical in shape and they are of size about 20 nm. Fourier transform infrared

(FTIR) images also showed that, shifting of broad peak as a result of the structural rearrangement.

5. The values of ultraviolet protection factor (UPF) were calculated before and after coating.

- The treatment forms a thin layer of titania on the surface of fabrics. The ultraviolet protection factor values were calculated showing excellent UV protection rating of the treated fabrics, which can be attributed to superior ability of the titania film to absorb, scatter and/or reflect ultraviolet radiation (UVR).

6. The durability of the treated fabrics to repeat laundering cycles are evaluated and the results showed excellent UV protection rating of the treated cotton fabrics, which can be maintained even after 40 home laundering.

7. The effect of sol-gel treatment on whiteness index (WI) and yellowness index (YI) of the treated fabrics are measured and the results showed a little increase in YI with subsequent decrease in WI. This may be attributed to the slightly yellow color of the prepared titania nanosol.

8. The effect of using different dyeing and finishing techniques on reactive dyeing process are accomplished on a lab-scale. The color strength and fastness properties of the dyed fabrics are evaluated.

- The results showed that, the effect of reactive dyeing in presence or absence of sol-gel treatment on both color strength (K/S) and ultraviolet protection factor (UPF) values showed an enhancement in case of pretreated/post dyeing, and a little effect on color strength (K/S).

9. The sol-gel treated fabrics show better enhancement in bacterial reduction %, which may be attributed to the