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UV-protection on textiles Using Nano titanium Dioxide

Previously organic and in organic UV absorbers were coated on the textile material they prevent UV radiation effectively but they are less durable.

UV blockers are usually certain semiconductor oxides such as TiO2, ZnO, SiO2 and Al2O3. Among these semiconductor oxides, titanium dioxide (TiO2) is commonly used.

It was determined that nano-sized titanium dioxide are more efficient at absorbing and scattering UV radiation than the conventional size and were thus better able to block UV.

This is due to the fact that nano-particles have a larger surface area per unit mass and volume than the conventional materials, leading to the increase of the effectiveness of blocking UV radiation. For small particles, light scattering predominates at approximately one-tenth of the wavelength of the scattered light.

Raleigh scattering theory stated that the scattering was strongly dependent upon the wavelength, where the scattering was inversely proportional to the wavelength to the fourth power.

This theory predicts that in order to scatter UV radiation between 200 and 400 nm, the optimum particle size will be between 20 and 40 nm.

UV-blocking treatment for cotton fabrics was developed using the sol-gel method. A thin layer of titanium dioxide is formed on the surface of the treated cotton fabric which provides excellent UV-protection; the effect can be maintained after 50 home launderings.

The titanium dioxide of 10 to 50 nm in length was applied to cotton fabric to provide UV protection. According to the study of the UV-blocking effect, the fabric treated with Titanium dioxide demonstrated an excellent UV protective factor (UPF) rating.

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