SELF-CLEANING CELLULOSE FABRIC WITH TiO_2 NANO PARTICLES

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During last 2-3 years, the nano-technology application in textiles has increased drastically because of the valuable properties this exhibit, those which were not there in the past. The fibers and fabrics treated by nanotechnology showed improved textiles properties such as water repellence, soil resistance, wrinkle resistance, anti-bacterial, anti-static, UV-protection, flame retardation, dye-ability improvement, self-cleaning, *etc.*,.

Self-cleaning effect of a textile material can be obtained by a photo-catalytically active coating such as titanium dioxide (TiO_2). The fabric is coated with a thin layer of titanium dioxide particles that measure less than 25 nanometers in diameter. When this semi-conductive layer is exposed to light, photons with energy equal to or greater than the band gap of the titanium dioxide excite electrons up to the conduction band. The excited electrons within the crystal structure react with oxygen atoms in the air, creating free-radical oxygen. These oxygen free-radical species are powerful oxidizing agents, which can break down most carbon-based compounds through oxidation-reduction reactions. In these reactions, the organic compounds (i.e. dirt, pollutants, and micro organisms) are broken down into substances such as carbon dioxide and water. Since the titanium dioxide only acts as a catalyst to the reactions, it is never used up. This allows the coating to continue breaking down stains over and over.

For experiments described in this report cellulose knitted fabric were chosen. The fabric was scoured to remove oils, fatty acids and to give more dye absorptivity, then the prepared nanoparticle TiO_2 was adsorbed at 60 ^oC under vigorous stirring and dyed using reactive dye, which has very good fastness properties, react very well with the cellulose and create strong covalent bonds. The adsorbed TiO_2 is expected to keep strongly bonded to the cellulose surface with the help of dye attached to the cellulose on top of the TiO_2 coating.