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Synthesis of Advanced Textile Functional Materials Using Titanium Dioxide Nanoparticles for Self-cleaning Applications

Due to their predefined size and shape, nanoparticles have gained much attention for material development in daily life applications. In textile industry, the modifying of conventional textile is required that can alter the entire property of the textiles. Therefore, it was need to develop a fabric which is antimicrobial and self-cleaning as well as protective against UV-irradiation without compromising the comfort of the fabric. Herein, the silver and titanium nanoparticles prepared via simple synthetic routes in a chemical laboratory are loaded in the commercial finishes for textiles to yield antimicrobial characteristics. The finished fabric constituted of 100% polyester, and blends of mod-acrylic and high performance polyethylene with viscose was generated by keeping in mind the upholstery applications. The product designed through this process can be used in many domestic and commercial applications including medical textiles. The nanoparticles are characterized via X-ray diffraction and Dynamic Light scattering analysis and overall antimicrobial characteristics of textile materials are evaluated by using standard methods. The characterized nanoparticles of 68nm (on average) in presence of binders are coated over the fabrics with modified structures via pad-dry-cure method. The nano-coated functional textiles yielded good air-permeability, moisture comfort properties, hydrophobicity (evaluated through contact angle measurement) and UV-protection factor (for coloured fabrics only). The whole textile material was also evaluated against gram negative and gram positive bacteria for its antimicrobial characteristics. Novel textile finishes using common laboratory chemicals have been developed and it is believed that these finishes contain excellent fabric comfort properties.

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