Meetings International SciTechnol

J Nanomater Mol Nanotechnol 2018, Volume: 7
DOI: 10.4172/2324-8777-C4-030

International Conference on

NANOTECHNOLOGY AND NANOENGINEERING

July 16-18, 2018 | Paris, France

Hydrophobicity imparted from self-assembled stearic acid molecules on Tio_2 nano-structures formed on textile surfaces through ultraviolet irradiation

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In recent years, hydrophobic layers formed on various surfaces have attracted a great deal of scientific and commercial attention due to their self-cleaning property with high water-repellent ability. TiO_2 nanostructures, particularly, vertically-aligned 1-D nanomaterials (nanotubes, nanowires, nanorods, etc.) with self-assembled long chain fatty acids such as stearic acid are commonly used to impart these properties on surfaces such as glass, shoes, textiles, gloves, and so on. Herein, we report a simple method to increase the hydrophobicity by increasing the number of self-assembled stearic acid molecules around TiO_2 nanoparticles. TiO_2 nanomaterials were formed on textile surfaces by dip-coating from a TiO_2 nanoparticulate dispersion formed from steam-assisted reaction of titanium isopropoxide. The treated fabrics were then exposed to UV light (λ = 256 nm) for different times varying from 0 to 40 minutes and dried at 120 ˚C for 10 minutes. The U- irradiated, TiO_2-treated fabrics were then dipped in a solution of stearic acid at 30 ˚C for 1 hr, and dried at 50 ˚C. Hydrophobicity of the textile surfaces were evaluated by measuring contact angles and roll off angles of each sample. Crystal structure of TiO_2 was characterized by X-ray deffractometry (XRD), surface morphologies by scanning electron microscope (SEM). According to the XRD data, TiO2 is composed of anatase form. Contact angles increased in the order 140˚, 146˚, 151˚, 154˚ and 161˚ with increased time of UV irradiation.

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