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Nanotechnology in modern textile era

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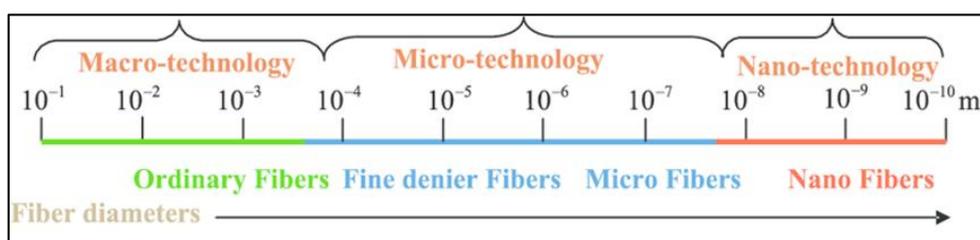
Abstract

The use of nanomaterial and nanotechnology based processes is growing at a tremendous rate in all fields of science & technology. The use of nanotechnology in textile industry has increased rapidly due to its unique and valuable properties. Textile industry is also experiencing the benefits of nanotechnology in its diverse field of application. Nanotechnology has versatile applications in Textile chemical industry in manufacturing garments with stem resistance, wrinkle resistance, finishes, antibacterial qualities, UV protection etc. The future success of nanotechnology in textile application lies in area where new principles will be combined into durable, multifunctional textile systems without compromising the inherent textile properties.

Keywords: nanotechnology, nanomaterials water repellent, anti bacteria, UV protection, wrinkle resistance

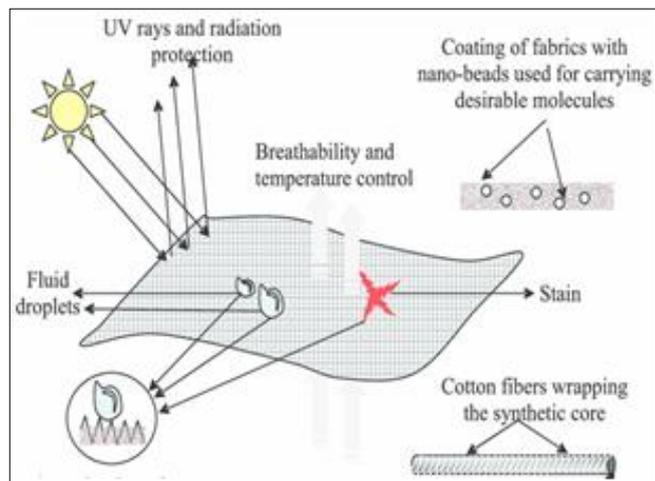
Introduction

The fast development and changes in life style has attracted peoples towards a more comfort & luxurious life. People are mixing towards a small, safe, cheaper and only reduces the work load but also help them to carry out their work at a much greater pace with minimum efforts. The term nanotechnology (sometimes shortened to nanotech) comes from nanometer a unit of measure of one billionth of a metre of length. The concept of nanotechnology was given by Nobel Laureate Physicist Richard Feynman in 1959. Nanotechnology is defined as the utilization of structures with at least one dimension of nanometer size for the construction of materials, devices or systems with novel or significantly improved properties due to their nano size. Nanoparticles commonly used in commercial products are in range of 1 to 100nm.



Nanotechnology is increasingly attracting worldwide attention because it is widely perceived as offering huge potential in a wide range of end uses. Nanotechnology has also real commercial potential for textile industry. Application of nanotechnology in textile industry has tremendously increased the durability of fabrics, increase its comfortness, hygienic properties and also reduce the production coast. Nanotechnology can provide high durability for fabrics because nanoparticles have a large surface area to volume ratio and high surface energy thus providing better effinity for fabrics and leading to an increase in durability of the function. The first work on nonotechnology in textiles was undertaken by nano-tex a subsidiary of US based Burlington industries. Later on more textile companies began to invest in the development of nanotechnology.

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Properties of Nanofibres

Water Repellence

Nano Tex improves the water repellent property of fabric by creating nanowhiskers which are hydrocarbons and 1/1000 of the size of typical cotton fiber that are added to the fabric to create a peach fuzz effect without lowering the strength of the cotton. The spaces between the whiskers on the fabric are smaller than the typical drop of water but still larger than water molecules. Water thus remains on the top of the whiskers and above the surface of the fabric. However liquid can still pass through the fabric if pressure is applied.

Apart from Nano Tex, the Swiss based Textile company Schoeller developed the Nanosphere to make water repellent fabrics. Nanosphere impregnation involving a three dimensional surface structure with get farming additives which repel water and prevent dirt particles from attaching themselves fall on to them water droplets bead up and if surface slopes slightly will roll off. As a result, the surface stay dry even during a heavy shower.

UV Protection

The most important function performed by garment are to protect wearer from weather. However it protect the wearer from harmful rays of the sun. Inorganic UV blockers are more preferable to organic UV blockers as they are non toxic and chemically stable under exposure to both high temperatures and UV. Inorganic UV blocker are usually certain semiconductor oxides such as TiO_2 , ZnO , SiO_2 and Al_2O_3 . Metal oxides such as ZnO as Hence nano ZnO will really enhance the UV blocking properly due to their increase surface area and intense absorption in UV region. This is due to their large surface area per unit mass and volume. A thin large of titanium dioxide is formed on the surface of the treated cotton fabric which provides excellent dioxide, zinc oxide rods of 10 to 50nm in length were applied to cotton fabric to provide UV protection.

Anti Bacterial

For importing anti bacterial property nano sized silver titanium dioxide and zinc oxide are used. It is considered that part of oxygen in the air or water is turned into active oxygen in by means of catalysis with metallic ion thereby dissolving the organic substances to create sterilizing effect with the use of nano sized particles no. of particles per unit area is increased and thus anti bacterial effects can be maximized. A range of antimicrobial textile finishes and quite a few have been commercialized which are based on much superior

antimicrobial properties of silver in nanoform.

Wrinkle Resistance

To impact wrinkle resistance to fabric resin is commonly used in conventional methods. However there are limitation to applying resin including a decrease tensile strength of fibre absorption resistance, water absorbency dye ability as well as breathability. To overcome the limitations of using resin some researches employed nano titanium dioxide and nano ratio to improve the wrinkle resistance of cotton and silk respectively. Nano titanium dioxide was employed with carboxylic acid as catalyst under UV irradiation to catalyse the cross linking reaction between the cellulose molecule and the acid. On the other hand nano silica was applied with maleic anhydride as a catalyst the results showed that application of nano silica with maleic anhydride could successfully improve the wrinkle resistance of silk.

Anti Static

Static charge usually builds up in synthetic fibres such as nylon and polyester because fibres have higher moisture content to carry away static charges so that no static charge can accumulate. It was determined that nano sized titanium dioxide, zinc oxide whiskers could impart anti static properties to synthetic fibres, TiO_2 , ZnO provide anti static effects because they are electrically conductive materials.

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