# Recent Innovations in Nano-Finishing in Textiles

**Introduction:**

With the advent of nano science and technology, a new area has developed in the area of textile finishing called "Nanofinishing". The term nano comes from the Greek word "Nanos" which means dwarf or abnormally small. If the criterion is to produce very minute particle size fibers and materials, nano technology is the only way to achieve the same. Nanotechnology can also be known as the technology that works at the molecular level, atom by atom to create large structures with improved molecular organization. Nanotech research efforts in textiles have mainly focused in two areas:

- Upgrading existing functions and performances of textile materials.
- Developing intelligent textiles with completely new characteristics and functions.

Nanotechnology has opened immense possibilities in textile finishing area resulting in to innovative new finishes as well as new application techniques. Particular emphasis is on making chemical finishing more controllable, durable and significantly enhance the functionality by incorporating various nanoparticles or creating nanostructured surface. Nano finishes are generally applied in non-emulsion form which enables a more thorough, even and precise application on textile surface. They are generally emulsified into either nano micelles, made into nano sols or wrapped in nano capsules that can adhere to textile substrates easily and more uniformly. Since nano particles have a large surface area to volume ratio and high surface energy, they have better affinity for fabrics. Therefore these finishes are more durable, effective and do not adversely affect the original handle or breathability of the fabric.

The different types of finishes in Nano finishing technology include the following:

**Hydrophobic Nano finish:**

Fluorocarbon finish is one of the most important nano finishes applied to textiles. Fluorocarbons are a class of organic chemicals that contain perfluoroalkyl residue in which all the hydrogen atoms have been replaced by Fluorine. These chemicals have very high thermal stability and low reactivity which reduce the surface tension therefore making the fabric hydrophobic in nature. The attached multifunctional molecule can impart wrinkle resistance by cross linking cellulose chains and also impart water-repellency, crease resistance, soil resistance, detergent free washing, increased speed od drying, etc. The durability of this finish is much better than the conventional fluorocarbon acrylate polymer based finish.

**Anti-microbial Finish:**

Silver ions have broad spectrum of antimicrobial activities. The method of producing durable silver containing anti-microbial finish is to encapsulate a silver compound or nano particle with a fiber reactive polymer.

**Photo-catalytic self-cleaning:**

Advanced orientation processes that are combination of powerful oxidizing agents with UV or near UV light have been used to remove organic pollutants from textiles. $TiO_2$ has been proved to be an excellent catalyst in photo degradation of colorants and other organic compounds. Nano sized $TiO_2$

particles show high photo catalytic activities because they have a large surface area per unit mass and volume as well.

**Anti-pollen finish:**

Miyuki Keori Co of Japan is marketing anti pollen garments or fabrics. The smoothness of the finish on the surface and the anti-static effect does not let pollen or dust come close. This is achieved by using the polymer which has anti-static or electro conductive composition.

**Flame Retardant finish:**

Nyacoll nano technologies. Inc has been the world's largest supplier of colloidal antimony peroxide which is used for flame retardant finish in textiles. Nano antimony pentoxide is used with halogenated flame-retardants for a flame retardant finish.

**Odor repellent finish:**

A Talwanese nanotech firm Greensheild has created underwear that fights odor which is achieved through nanotechnology. Negative ions create a magnetic field that inhibits the reproduction of odor causing bacteria.

**UV protection:**

Nano clay particles of montnorblonite is one of the most commonly used UV blocker. It also increases 40% tensile strength and 60% flexural strength. 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.

Nano particles has thus emerged as the key technology which has revitalized the material science and thus has immense potential for development and evolution of a new range of improved materials including polymers and textiles. To conclude, Nanotechnology definitely has the potential to being a revolution in the field of technical textiles.

http://textilelearner.blogspot.com/search/label/Nanotechnology