

Textile comfort and nano fibers

Opinion

Comfort is a fundamental and universal need of a human being. However, it is very complex and very difficult to define. Comfort involves thermal and non-thermal components and is related to wear situations. The physiological responses of the human body to a given combination of clothing and environmental conditions are predictable when the system reaches steady state. Accordingly, comfort is a pleasant state of physiological, psychological, and physical harmony between a human being and the environment. Physiological comfort is defined as the achievement of thermal equilibrium at normal body temperature with the minimum amount of bodily regulation.

Thermal comfort of clothing is directly influenced by the type of materials used and the properties of those materials, including thermal conductivity, water vapor permeability, air permeability and water impermeability. Thermal comfort can be in part assessed through measuring the moisture management capacity of clothes. Moisture management often refers to the transport of both moisture vapor and liquid away from the body. Moisture vapor can pass through openings between fibers or yarns. This action prevents perspiration from remaining next to the skin.

As a result, moisture management has the ability to control the microclimate between the body and the garment. Moreover, external environments (physical, social, and cultural) have great impact on the comfort status of the wearer, and researches have shown that there is a close relationship between moisture and thermal comfort. Moisture management is one of the most important considerations when buying apparels.

The growing application of emerging technologies (Nano, bio...) has provided a much needed impetus for a paradigm shift in textiles. Apart from apparels, textile materials are now being used for many technical applications, where the next generation of textiles is likely to incorporate nanotechnology.

In view of the rapid development of Nano science and nanotechnology, great progress has been made in nanotechnology functional applications. The recent developments in Nano fibers production technology has opened up the possibilities of applying Nano fibers for various process improvements. The adoption of this technology in the industry has been slow at best and even then.

Nano fibers offer hope in finding solutions for fundamental problems in the development of human society – the cleaning and production of drinking water, mobile sources of energy, batteries enabling advanced energy storage. These are problems which directly concern millions of people. Further development in these regions is dependent upon solutions being found, and this huge potential demand represents a great business opportunity.

Volume 1 Issue 3 - 2017

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Received: April 01, 2017 | **Published:** April 05, 2017

Demand for products containing Nano fibers is expected to grow by as much as 40%. Nano fibers offer immense opportunities for creating products with new properties, as they enable the modification or functionalization of a Nano fibrous layer using various chemical or physical processes during or following the production process. Functionalization can significantly improve surface properties, creating for example super-hydrophobic (water repellent) or super-hydrophilic (highly water absorbent) materials.

The uniformity of Nano fibrous layers, their thinness and high permeability make them a crucial material for many industries. Nanotechnology can enhance physical, psychological and physiological comfort of apparels through the following aspects:

- a. Wicking moisture away from skin leading to light and dry clothes that will reduce skin chafing while retaining the fabric natural softness
- b. Balances body temperature by maintaining the fabric breathability
- c. Allows stains to wash out easily while maintaining natural absorbency
- d. Resists spills and repels the elements (repels lint, dust, dirt and pet hair)
- e. Provides permanent static protection

Acknowledgments

None.

Conflict of interest

Author declares there is no conflict of interest in publishing the article.