

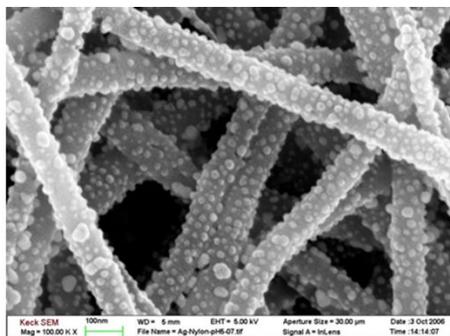
# Textile Structures are Ideal Substrates for Nano Particle Finishes and they Permit Major Improvement in Performance Properties

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## Case Description

Fiber products are among the most suitable substrates for the application and fixation of nanoparticle finishes because they offer a large surface area per unit weight. The surface area advantage along with the ability of fibers to quickly interact with the particles and make them bind to the surface served as an attraction for the rapid penetration of nanotechnology in the textile industry. The possibility of attaching several types of nanoparticles to the same fiber product to produce truly multifunctional end-products with a desired set of performance properties is another reason why nanotechnology is making rapid strides in the textile industry. In fact, many scientists have expressed the opinion that textile industry is one of the major industries that successfully demonstrated the benefits of nanotechnology and is making rapid strides through it (Figure 1).



**Figure 1.** Electrospun nylon nanofibers, coated with antibacterial silver nanoparticles.

The application of nano finishes on textile products has shown major improvements in their durability, comfort performance, antibacterial performance, absorption and drying performance, water repellency, biocompatibility, protective performance, etc. Nanotechnology is also believed to offer advantages over conventional processes in terms of reduced production costs, energy savings, eco-friendliness, controlled and conditional release of substances, light weight products, economic packing and storing, etc.

The particle size of the finish plays a critical role in determining its adhesion to the fibers. It is reasonable to expect large particles to be

easily removed from the fiber surface, while small particles can be expected to penetrate deeper and adhere more strongly [1]. The large surface area of the fibers and their high surface energy also account for improved affinity between the finish particles and the fiber surface, thus improving the durability of the functional performance properties. A whole variety of novel nanotech textiles are already available in the market. Among the products that already demonstrated enhancement through nanotechnology are sports performance clothing, a range of skincare materials, space technology products and extreme weather clothing. The use of nanotechnology allows textiles to become multifunctional and the multifunctional fabrics carry not just one but a set of functional performance properties. The properties required for a particular end use can be chosen from a range of available properties such as antibacterial performance, UV-protective performance, easy cleanability, water repellency, stain resistance, mosquito repellency, fire retardancy, anti-odor performance, electrical conductivity, and a host of other properties that are not available through conventional treatments.

Progressive textile manufacturers around the globe are already working to produce value added and performance engineered textile products using the many advances that are taking place in the nanotechnology field [2]. Within the next decade or so, a new generation of nanotechnology enhanced fiber products made through weaving, knitting, nonwoven technologies, composite material technologies and tufting can be seen around the globe. Those who succeed in doing this would be in an advantageous position over the rest.

## References

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**How to cite this article:** Parachuru, Radhakrishnaiah. "Textile Structures are Ideal Substrates for Nano Particle Finishes and they Permit Major Improvement in Performance Properties." *J Textile Sci Eng* 13 (2023): 526.

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Received: 13 February, 2023, Manuscript No. JTESE-23-89252; Editor assigned: 16 February, 2023, Pre QC No. P-89252; Reviewed: 02 March, 2023, QC No. Q-89252; Revised: 03 March, 2023, Manuscript No. R-89252; Published: 31 March, 2023, DOI: 10.37421/2165-8064.2023.13.526