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## PHYSICAL AND MECHANICAL PROPERTIES OF COTTON FABRICS PRE-TREATED WITH NANO-SILVER

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Nano-silver, one of the most widely used antibacterial agents in recent years, has the potential to be used in a wide range of textiles. Textiles are complex visco-elastic materials. They need to have sufficient strength while maintaining flexibility and elasticity. The aesthetic appeal of apparel and functionality of fabrics used in clothing are determined by their physical, mechanical and chemical properties. Fabric finishing treatments such as incorporation of nano-silver can influence these properties because of the small size and high surface area of nano-particles, leading to, for example, high chemical reactivity.

In the present study, effects of nano-silver finishing on physical and mechanical properties of laboratory scoured 100% cotton fabrics were examined. Nano-silver colloids were prepared by chemical reduction of  $7 \times 10^{-4}$  and  $1 \times 10^{-3}$  mol dm<sup>-3</sup> silver salt solutions, and characterized using ultraviolet-visible spectrophotometer and particle size distribution analyser; the two colloids had surface Plasmon resonance peaks at 420 and 423 nm, respectively, with an average particle size distribution between 30 to 60 nm. 100% Cotton fabric samples were stirred with nano-silver colloid at 60 °C. Stirring and elevated temperature enhanced the mobility of the nano-silver particles in the solution. The nano-silver-treated samples of fabric were subjected to further finishing with the pad-dry-cure method.

Incorporation of nano-silver on cotton was confirmed by examination of the samples with scanning electron microscopy, elemental analysis and ultraviolet-visible spectrophotometry. The physical properties, measured in accordance with British and ISO standards, included the following: thickness, weight, breaking strength, breaking elongation, bending length, flexural rigidity and crease recovery.

The nano-silver treatment increased fabric quality of stiffness slightly and decreased the crease recovery angle. Breaking strength and breaking elongation in both warp and weft directions also increased in the nano-treated samples. These results indicate that the nano-silver treatment on cotton fabrics not only confers antibacterial properties to the fabrics, but also improves their desirable physical properties.

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