

## **Plasma Pre Treatment for Improving the Durability of Antibacterial Activity of Cotton Using ZnO Nanoparticles**

**Sheila Shahidi**

Department of Textile, Arak Branch, Islamic Azad University, Arak, Iran  
sh-shahidi@iau-arak.ac.ir

**Hootan Rezaee, Abosaeed Rashidi**

Department of Textile, Science and Research Branch, Islamic Azad University, Tehran, Iran  
rashidi50@yahoo.com

**Mahmood Ghoranneviss**

Plasma Physics Research Center, Science and Research Branch, Islamic Azad University, Tehran, Iran  
ghoranneviss@gmail.com

### **Extended Abstract**

Plasma treatment has an explosive increase in interest and use in industrial applications as for example in medical, biomedical, automobile, electronics, semiconductor and textile industry. A lot of intensive basic research has been performed in the last decade in the field of textiles along with technical textiles. Textile manufacturers and end-users alike have been searching for ways to improve the surface properties of natural and man-made fibers. Specifically, there is a need to improve adhesion and wettability. Functional groups may be introduced onto the fiber surface by using gas plasma treatments, improving fiber surface properties without affecting the fiber's bulk properties.

In this research work, ZnO nanoparticles (ZnO-NPs) were insitue synthesized by sonochemical method at room temperature on both untreated and plasma pretreated cotton woven fabric. Air and nitrogen plasmas were used for pre-functionalization of cotton fabric. And the effect of oxygen and nitrogen pre-functionalization on adhesion properties between ZnO nanoparticles and cotton surface were studied.

The results show that nanoparticles with average sizes of 20-100 nm with different morphologies have been created on the surface of samples. Synthesis of ZnO-NPs was varied in the morphological transformation by changes in zinc acetate dehydrate concentration.

Characterizations were carried out using Scanning Electron Microscopy (SEM), X-ray Diffraction (XRD), Inductive coupled plasma (ICP) and Spectrophotometry. The antibacterial activities of the fabrics were assessed semi-quantitatively by the colonies count method. The results show that the finished fabric demonstrated significant antibacterial activity against S.aureus in antibacterial test. The wash fastness of both untreated and plasma pre-treated samples after 30 times of washing were investigated. The results showed that the parameters of plasma reactor plays very important role for improving the antibacterial durability.