Effect of Nanosized Colloidal Copper on Cotton Fabric

D.P. Chattopadhyay, Ph.D., and B.H. Patel

Department of Textile Chemistry, The M S University of Baroda, Vandodara, INDIA

ABSTRACT

This research deals with the synthesis of nanosized copper as colloidal solution and its application to cotton fabric. Copper nano colloids were prepared by chemical reduction of copper salt using sodium borohydride as reducing agent in presence of tri-sodium citrate. The size and size distribution of the particles were examined by particle size analyzer and the morphology of the synthesized particles was examined by SEM and AFM techniques. X-ray fluorescence spectroscopy detected the presence of copper in the treated fabric. The results of particle size analysis showed that the average particle size varied from 60 nm to 100 nm. The nano copper treated cotton was subjected to soil burial test for the assessment of its resistance towards microbial attack. SEM images of treated fabric indicate copper nano particles are well dispersed on the surface of the specimens. The treatments of nano copper colloidal solution on cotton not only improve its antimicrobial efficiency but also influenced the tensile strength of the fabric sample positively. The treatment was found to enhance the color depth and fastness properties of direct dyed cotton fabric samples.

New Approach for Determining Tortuosity in Fibrous Porous Media

Rahul Vallabh, Pamela Banks-Lee, Abdel-Fattah Seyam

College of Textiles, North Carolina State University, Raleigh, NC USA

ABSTRACT

A method to determine tortuosity in a fibrous porous medium is proposed. A new approach for sample preparation and testing has been followed to establish a relationship between air permeability and fiberweb thickness which formed the basis for the determination of tortuosity in fibrous porous media. An empirical relationship between tortuosity and fiberweb structural properties including porosity, fiber diameter and fiberweb thickness has been proposed unlike the models in the literature which have expressed tortuosity as a function of porosity only. Transverse air flow through a fibrous porous media increasingly becomes less tortuous with increasing porosity, with the value of tortuosity approaching 1 at upper limits of porosity. Tortuosity also decreased with increase in fiber diameter whereas increase in fiberweb thickness resulted in the increase in tortuosity within the range of fiberweb thickness tested.

Preparation of Chitosan Biguanidine Hydrochloride and Application in Antimicrobial Finish of Wool Fabric

Xue Zhao, Ph.D., Zhen-Zhen Qiao, Jin-Xin He

Donghua University, Sung Yiang, China

ABSTRACT

Chitosan biguanidine hydrochloride (CGH) has been synthesized by the guanidinylation reaction of chitosan with dicyandiamide. Its synthetic mechanism was discussed. The structures of CGH were characterized by FT-IR and ^{13}CNMR. In this study, we used citric acid (CA) as a crosslinking agent, mixed with CGH to perform a pad-dry-cure treatment on wool fabric to study its antimicrobial effects with the help of scanning electron microscopy (SEM). The result showed that there was no obvious sign that CGH adhered to the wool fabric if the wool fabrics were not oxidized by hydrogen peroxide. The surface crosslinks of the oxidized wool fibers were relatively coarse, which beneficial for the antimicrobial and antiseptic effects of the wool fabrics.

Electrical Resistivity Studies on Polyaniline Coated Polyester Fabrics

R. Neelakandan and M. Madhusoothanan

Department of Textile Technology, Anna University, Chennai, INDIA

ABSTRACT

The effect of fabric parameters such as type of weave and pick density on electrical surface resistivity of polyaniline coated fabric was studied. The fabric structure greatly influences the fabric electrical resistivity. Among the samples tested the twill structure with high picks per inch shows lower surface resistivity. The plain structure which has more interlacement points shows higher resistivity.

How Is Frayed Fiber Generated during Refining Process? (Identification of Frayed Fiber under High Resolution Microscope)

Yuhe Chen and Mousa M. Nazhad, Ph.D.
Asian Institute of Technology, Pathumthani, Thailand

ABSTRACT
The objective of this study is to characterize frayed fiber[1] under high resolution microscope to unveil fiber fraying. Based on observation with high resolution microscope, the classification of frayed fibers has been done to contribute to clarifying fiber fraying mechanism. One rectification on previous recognition of frayed fiber has been made to indicate that the dominating cases for fiber fraying are many fibers fraying in one point instead of single fiber fraying at fiber cut site as previously reported[1]. Thus the rectification/removal of fallacious knowledge of frayed fiber favors to clarify this issue. It is further indicated that the unveiling or clarification of fiber fraying mechanism is mainly based on the integration between classification of frayed fiber and traditionally proven effects of refining on various fiber changes from LC to HC refining process. Thus, a latest and newly-built theory responsible for fiber fraying during refining process has been proposed in this paper. With convincing reasoning and speculation, this newly established theory proposed in this paper could go through various visible phenomena and effects of frayed fibers as published earlier[1].

This theory proposes that frayed fibers are
generated based on the integration of "splitting" and "locally high consistency" mechanisms. In other words, the intensive external fibrillation responsible for "splitting" and "locally high consistency" theory is one of the most important effects of refining on frayed fiber generation. Therefore, the origin of fiber fraying could be the intensive external fibrillation(LC refining at high energy) integrated together with certain fiber type (SW), the methodology of fiber processing(BSKP), refiner type(Escher Wyss) and friction between fibers and equipment. This theory further indicates that any intensive external fibrillation equivalents generated in any conditions other than LC refining at high energy also permit fiber fraying generation.

Computational and Experimental Investigation of Moisture Transport of Spacer Fabrics

Sedigheh Borhani, Safora Seirafianpour, Seyed Abdolkarim Hosseini Ravandi, and Reza Mokhtari, Ph.D.
Isfahan University of Technology, Isfahan, IRAN

ABSTRACT
This paper investigates the moisture transfer behavior of spacer fabrics. Spacer structures are knitted fabric constructions comprising two separate fabrics which are joined together by spacer threads. In order to investigate the dynamic moisture transfer of spacer fabrics, an experimental apparatus was developed which made the simulation of human body sweating possible.

In the experimental section, the influence of some parameters such as the kind of spacer threads and also heat setting under drawing on moisture transport properties is investigated. Heat setting under drawing affects air permeability, thickness and porosity of spacer fabrics. The Results showed that water vapor produced by sweating can be easily and quickly transferred from the skin to the outer surface to keep the skin dry. In the computational section, a mathematical model was developed to describe moisture transport behavior of spacer fabric. The model was in high good agreement with the observations in the experiments.