PHYS.ORG

Scientists to Develop Textiles With Permanent Antibacterial Properties

June 20 2005

Antimicrobial agents are not new to the marketplace. Our stores are filled with antibacterial soaps and gels, and in a post-9/11 world, wearable protection from biological agents is in increasing demand. So far, antimicrobial textile production has used coatings that can wash away over time, reducing the useful life of protective clothing.

At North Carolina State University, nuclear and textile engineers have joined forces with textile scientists from Egypt to create textiles that have permanent antimicrobial properties. Dr. Mohamed A. Bourham, professor of nuclear engineering, and Dr. Marian G. McCord, associate professor of textile engineering, chemistry and science and biomedical engineering, are working with Professor Samiha Gawish and Ameera Ramadan from the National Research Center in Cairo, Egypt, to produce this new generation of antimicrobial textiles.

Using atmospheric plasma and glycidyl methacrylate (GMA), a chemical catalyst, to open the molecular bonds of fibers, the research team has been able to successfully attach antimicrobial agents to the molecular structure of fibers, creating a permanent bond between the fibers and the agent so that washing and wearing do not reduce the efficacy.

“There are many applications for such a process,” Bourham says. “For instance, we could create wool that would be moth-proof, or we could produce cotton and synthetic materials for use in hospitals and other places where bacteria present a hazard.”

Sponsored by the National Science Foundation (NSF) and the U.S. Department of State through the U.S. Embassy in Egypt, the joint research project has potential for defense, homeland security and health care applications. For example, a soldier or emergency responder wearing clothing made of this special fabric could be protected from biological agents. Other applications include surgical scrubs and hospital bedding, which could lead to reduced infection rates among patients.

The current coating process, with its chemical bath and drying time, creates chemical soups that can harm the environment, making it both costly and environmentally unfriendly. But the plasma-based process developed at NC State eliminates chemical wastes, making it a more environmentally sound investment. And fabrics made of molecularly altered fibers would be more economical for the end user since the properties are embedded in the molecular structure of the fibers, meaning uniforms, sheets and other items would not have to be replaced to maintain a high level of efficacy.

Keeping in mind that production cost and retooling would be an issue for textile manufacturers in both Egypt and the United States, the researchers designed their system so that it can be plugged into an existing production line easily without interrupting the process.

Tests performed at U.S. Department of Agriculture (USDA) laboratories at NC State by Dr. Fred Breidt, associate professor of microbiology/fermentation, and Dr. Doria Wafa, visiting scientist in food science for the USDA, confirmed that the fabric samples altered with chitosan, a naturally occurring antimicrobial agent made from the shells of crabs and other shellfish, were up to 90 percent effective against three commonly occurring microorganisms: Lactobacillus planterum, E. coli and Staphyloccus aureus.

Bourham, McCord and Gawish so far have created synthetics using this process, and they are currently working with cotton and wool. The application to cotton could prove beneficial to the Egyptian economy because cotton and textiles have long been important industries.

“This kind of cooperation between two countries is very important,” Bourham says. “The support by the NSF and the State Department makes it possible for us to conduct this research that can benefit the textile industries in both countries.”

Source: North Carolina State University

Citation: Scientists to Develop Textiles With Permanent Antibacterial Properties (2005, June 20) retrieved 19 April 2024 from
https://phys.org/news/2005-06-scientists-textiles-permanent-antibacterial-properties.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.