

**CLEMSON UNIVERSITY
RESEARCHERS WEAVE FABRIC OF
THE FUTURE**

By David Forman
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Feb. 10, 2005 – What do you get when you put together a physical chemist, two polymer scientists and a self-proclaimed "fiber guy" (that is, a textile chemist)?

A self-cleaning suit, of course.

At least that's among the goals of an interdisciplinary research team at Clemson University in Clemson, S.C.

"It was about two years ago," recalled Phil Brown, a textile chemist in Clemson's materials science and engineering school. "Igor (Luzinov) said, 'What do you think about developing a lotus fiber?'"



Clemson University chemist Phil Brown sees a model of natural nanoscale functionality in the lotus leaf.

The lotus leaf is known for being naturally water-repellant. Luzinov, a polymer scientist at Clemson and the project team leader, proposed developing a custom coating that would be applied to make a fiber mimic the lotus. The combination, he surmised, would be both water and dirt repellent.

The group brought together another polymer scientist, Sergiy Minko of Clarkson University in Potsdam, N.Y. and physical scientist George Chumanov of Clemson. The quartet secured funding from the National Textile Center, a research consortium of eight universities that is supported by the Department of Commerce. Four graduate students assist the scientists in their work.

Their research, presented in November during the

southeast regional meeting of the American Chemical Society, is getting some attention. "What makes this unique is that it is ultra hydrophobic," said Martin Jacobs, executive director of the National Textile Center. "The technology goes beyond anything now on the market."

Jacobs said the difference between what the Clemson project has achieved and other approaches is that water used to clean the fabric picks up dirt and wicks it off rather than just move it around. As a result, a quick spray with a hose, rather than a complete wash, could be enough to clean the fabric.

The technology works by putting nanoscale bumps on a textile that are so small that agglomerated water droplets don't fall into the troughs. That keeps water and dirt on the surface of the fabric, yet with a minimum of surface contact between them and the fabric fibers. As a result, dirt comes off easily when a spray of water is applied. In short, Jacobs said, water and dirt don't "get a grip" on the fabric.

The phenomenon is achieved using a coating that chemically alters the fabric to which it is applied. However, Clemson chemist Brown said the coating – a polymer film mixed with silver nanoparticles – does not compromise the performance characteristics and feel of the fabric with which it is combined.

Brown said the research also has potential applications in optical communications and biomedical engineering. Although the work is very early stage, Brown said it could have significant commercial impact because manufacturing textile fibers is inexpensive compared to other processes and materials.

Likely early applications could be anything from hospital garments to sportswear and military uniforms to rain coats. The team wants to make the fabric antimicrobial in addition to self-cleaning. Brown said the fabric could also be used for outdoor purposes such as awnings, lawn furniture fabric or convertible car tops, but he expects it will take at least five years before there is a product on the market.

Jacobs said that is a reasonable time frame. The initial research is slated to take up to three years, after which he said he would expect a robust technology. After that, he said it would probably take a couple more years to develop it into actual products.