

Georgia Tech Conducts Textile Research on UV Protective Clothing for Skin Cancer

Sports enthusiasts spend a great deal of time in the outdoors under the potentially harmful and penetrating ultraviolet radiation of the sun. Over-exposure to these invisible rays can lead to sunburn, accelerating the aging process, and in extreme situations can cause skin cancer.

To some extent, all fabrics tend to reduce exposure to UV rays because of the fact they cover the skin. However, there are specially designed technical clothing currently available in the marketplace that offer the greatest protection. These technical fabrics carry the Ultraviolet Protection Factor (UPF) value, which is a rating system used to certify UV protective apparel.

Georgia Tech's research is intended to extend and expand on specific UV textiles that are currently available in the market, including new functionally designed synthetic fibers, and examine new ways of applying chemical finishes on them can further enhance the ability of clothing to protect the skin from UV damage.

Georgia Tech's research is focused on enhancing the UV protective performance of the most commonly used fabrics, namely 100 percent cotton and cotton/polyester fabrics. The research examines three main aspects of clothing design: fabric construction; the selection of the most appropriate dyes; and the use of improved finishing treatments.

The program utilizes the AATCC Method 183, sample preparation based on ASTM D6544, and labeling done as specified by ASTM D6603, and looks at the role played by fabric construction parameters, such as weave pattern, yarn packing density, fabric packing density, fiber volume fraction, etc. on the UPF of clothing materials.

Until now, no research effort has been directed at optimizing the UV protective performance of fabrics made from different types of spun yarns. In addition, no research has indicated that certain materials applied to the fiber in the form of nano-particles could provide more durable and enhanced UV protective performance.

Dr. Krishna Parachuru, the lead professor on the project, explains, "Our research is being conducted by using multiple dyes to color the fabric and applying finishes in the form of nano particles. Based on new understanding of the influence of yarn structure, we will also be able to suggest ways and means of designing UV protective fabrics from different yarn types."

Georgia Tech's research has shown that a combination of dyes as opposed to a single dye applied to cotton fiber can give better UV protection. Dr. Parachuru notes, "It is a common practice today to incorporate titanium dioxide (TiO₂) particles into natural and synthetic fibers as a way of enhancing the UV protective performance of clothing materials. The addition of TiO₂ particles makes the polyester fiber opaque (less transparent), which cuts down on the amount of UV radiation transmitted to the skin through the fibers. However, recent research also indicates that there are materials other than TiO₂ that can be added to synthetic fibers in the form of nano particles, which would substantially reduce UV transmission to even lower levels."

Currently, short staple yarns produced by ring spinning, rotor spinning and air-jet spinning are widely used in the construction of outerwear fabrics. The yarns representing these technologies have very different structures, which affects the way UV radiation is transmitted, absorbed



and scattered.

Dr. Parachuru explains, "Our research measures the differences in the protective performance, based on the yarn structural differences, and will suggest ways of minimizing these UPF differences by optimizing the fabric construction and the finishing routine for each yarn type."

Over the next three years, Georgia Tech's ultimate goal is to advance the state-of-the-art design and the commercial production of UV protective clothing. ●

For more information on this expanded research on UV protection, contact Dr. Krishna Parachuru at Krishna.parachuru@mse.getech.edu or 404-894-0029.

Kathlyn Swantko, president of the FabricLink Network, created TheTechnicalCenter.com for Industry networking and marketing of specialty textiles, and FabricLink.com for consumer education about everything fabric.

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509 Glenbrook Road • Stamford, CT. 06906 • USA