Research Grants Awarded

Each year, the AATCC Foundation provides thousands of dollars in funding for undergraduate and graduate research in textiles and related fields. This year's recipients will be looking into such varied topics as motorcycle crash simulation and pesticide-degrading fibers. Their research abstracts are included below.

Monica Baziotes, Florida State University

Comparison of Laboratory Test Method for Abrasion and Field Testing by Simulated Motorcycle Crash

Very little research has been published regarding protective clothing for motorcycle enthusiasts. The availability of sufficient protective apparel for motorcycling has not been studied, and with the changes in technology and the use of protective equipment, research is needed

Operating a motorcycle can expose nearly all areas of the body to injury of varying degrees. Several studies have reported the lower limbs as an area at risk for injury. Protective clothing for motorcycling serves various purposes, including prevention of injury during a crash.

A preliminary environmental scan indicates frequent use of denim fabric in lower body garments for motorcycle riders. Previous research of protective clothing only analyzes leather and Kevlar full-body suits. Accuracy of laboratory results was not established with comparative field testing in the development of the Cambridge apparatus.

The proposed study will investigate fabrics used in the design of motorcycle apparel, specifically, lower body garments. It will compare the standard test method for abrasion with simulated motorcycle crash field testing of lower body apparel fabrics. This research will establish a need to further study the abrasion resistance of motorcycle protective clothing, to include the communication of findings and the education of motorcycle riders.

Jing Cao, University of Georgia

Near-Infrared Spectroscopy for Anti-Counterfeiting of Innovative Fibers

Near-Infrared (NIR) spectroscopy has gained increased potential for the qualitative and quantitative evaluation of textile and polymer products. Many NIR instruments have been commercialized to identify natural and synthetic fibers. As several high-performance textiles are under development for enhancing human performance, health, and comfort, there is a strong need to have an NIR database of these high-performance fibers to detect contraband textile materials rapidly and quantitatively. The objective is to use NIR spectroscopy in combination with chemometric methods to establish an NIR library of spectra to identify innovative fibers.

Laura Lange, Cornell University

Effects of Etching on Methyl Parathion Degradation with Immobilized Magnesium Oxide Nanoparticles

Pesticides pose a danger for agricultural workers through dermal absorption. Current agricultural personal protective equipment (PPE) involves impermeable barriers. This type of barrier can be uncomfortable because as it blocks the passage of dangerous chemicals, it also blocks water vapor and air from flowing through the material. The proposed research aims to develop fibers that degrade pesticides, such as methyl parathion, before they are absorbed through the skin. These modified fibers will be incorporated into conventional fabric structures that allow water vapor to pass through, thereby increasing comfort. To achieve fibers with such functionality, magnesium oxide (MgO) nanoparticles will be added into a polymer melt extruded fiber. These fibers will then be treated with varying degrees of an etchant to expose a maximum surface area of MgO. There are three steps to the proposed research. Firstly, the kinetics for the reaction between methyl parathion and MgO nanoparticles will be tested without the fibers. Secondly, fibers will be made with and without nanoparticles and the etchant will be applied. Thirdly, the extent of degradation for all three fiber types will be compared to determine the effect the etching process has on the functionality of the fibers.

Helan Xu, University of Nebraska—Lincoln

Fabrication of Hollow Nanocapsules from Zein by a Phase-Separation Method and Investigation of Their Applications in Textiles

In this project, hollow nanocapsules from zein, a corn storage protein, will be fabricated using a phase separation method. Encapsulating capability of hollow zein nanocapsules will be measured and influence of preparation parameters on properties of nanocapsules will also be investigated. Loading of two kinds of drugs, cationic colistin sulfate and anionic diclofenac, into zein nanocapsules will be carried out. Further application of drug-loaded zein nanocapsules as finishing agents of gauze will also be investigated.

Fabrication of hollow zein nanocapsules is of great significance and importance. Zein has been made into microcapsules with diverse core materials. Hollow nanocapsules have potential to encapsulate various core materials, and have high encapsulating efficiency. However, preparation of hollow zein nanocapsules has not been reported yet. Good biocompatibility and biodegradability of zein make it suitable for medical applications, such as scaffolds in tissue engineering and drug carriers in drug delivery. Therefore, zein should also be usable on medical textiles. Nevertheless, few reports concerning applications of zein in textiles have been found. Hollow zein nanocapsules loaded with various drugs will be good candidates for multifunctional finishing in medical textiles. Using drug-loaded zein nanocapsules in multifunctional medical finishing can simplify procedures in practice. Moreover, a high release ratio and high utilization ratio can be achieved since isolation of drugs prevents both reactions among drugs and absorption of drug molecules into inner fiber structures.

In this study, different weight ratios of solvent to zein, different weight ratios of zein to template core material (calcium carbonate), and different weight ratios of precipitating water to zein will be used to prepare hollow zein nanocapsules. Particle sized and zeta potential of hollow zein nanocapsules prepared under these conditions will be measured. Morphological analysis of hollow zein nanocapsules will be measured by SEM and TEM. Encapsulating efficiency of drugs into hollow zein nanocapsules will be evaluated.

Learn more about Foundation grants:
www.aatcc.org/foundation/grants/research.htm