Detecting Counterfeiting of High-Performance Fibers

On Track: Jing Cao uses NIR spectroscopy to collect data for anti-counterfeiting research.

Research at the University of Georgia is using Near-Infrared (NIR) spectroscopy to develop a high-tech database to prevent counterfeiting of high-performance fibers.

NIR imaging is already being used extensively in a variety of industries. Jing Cao, a graduate student at the University of Georgia involved in the research, states, "Near-Infrared spectroscopy is a simple, rapid and nondestructive method for process control, quality assessment and anti-counterfeiting in many industries, such as food, petrochemical, pharmaceutical and environmental."

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JING CAO
UNIVERSITY OF GEORGIA

On the textile side, NIR spectroscopy is already the most well-established technique to identify the fiber content of clothes (i.e. cotton, rayon, nylon and PET).

IR analysis has the capability of providing precise and conclusive information regarding polymer formation. In fact, the American Society for Testing Materials (ASTM) recognizes IR spectroscopy as the preferred process for identifying manufactured fibers. According to ASTM, "where the data is consistent and the spectra is obtained and interpreted by an experienced spectroscopist, the IR procedure has no known bias."

Through the research being done by Cao, along with her graduate research advisor, Dr. Suraj Sharma, NIR spectroscopy is being taken to the next level. Their objective is to use NIR in combination with statistical and computer methods to develop an NIR Database and library of Innovative Fibers for detecting counterfeit textile materials.

Cao explains, "Recently a number of innovative fibers have been developed with superior chemical, physical or mechanical properties. Given the high price and the advanced end-use applications involved, anti-counterfeiting identification of these fibers is definitely important!"

It's important to define some pertinent scientific terms.

- **Infrared Light** – A wavelength longer than red in the color spectrum. IR light is not visible to the human eye.
- **Near-infrared Light** – A wavelength above red at the lower end of the infrared spectrum. NIR light is not visible to the human eye.
- **Spectroscopy** – The study of the interaction of light and matter, such as the measurement of the wavelength and intensity of the absorption of NIR light by a sample fabric.

According to Cao the absorbed wavelength will form a unique NIR signature on each fabric's chemical makeup, similar to a fingerprint. She explains, "In our NIR database, the unique signature of the material will be compiled and pre-treated to maximize its distinctive features, and minimize the collection of irrelevant information. Pre-treatment of spectra (in fabrics) are very important, because NIR spectra provide vast amounts of analytical information about the chemical, physical, and structural variables. Depending on the purpose of the analysis, different pre-treatment methods need to be determined, which is the primary objective of our research."

Cao and Sharma anticipate their research will provide a reliable method for identifying high-performance fibers, ensuring integrity and protecting against counterfeiting. Going forward, they expect the database to be an important tool, together with the development of commercial portable NIR instruments, to counter the fake labeling problem.

For more information on the Near-Infrared Spectroscopy for Anti-Counterfeiting of Innovative Fibers, contact Jing Cao, University of Georgia, 480-347-5011, jingcao@uga.edu. ●

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