A115 The Microscopic, Spectrophotometric, Chromatographic, Chemical Characterization, and Discrimination of Eco-Fibers

Brooke W. Kammrath, MA, MS, and Dale K. Purcell, MS, CUNY Graduate Center/John Jay College of Criminal Justice, 365 Fifth Avenue, New York, NY 10016; Adanna Grandison, BS, and Kristy Sekedat, BS, John Jay College of Criminal Justice, 445 West 59th Street, New York, NY 10019; and Thomas A. Kubic, JD, PhD, and John A. Reffner, PhD, CUNY Graduate Center/John Jay College of Criminal Justice, 365 Fifth Avenue, New York, NY 10016*

After attending this presentation, attendees will obtain knowledge of the microscopic, spectrophotometric, chromatographic, and chemical properties of eco-fibers as well as the optimal method for their discrimination.

This presentation will impact the forensic science community by providing the complete characterization of eco-fibers and the best method for their discrimination.

The general population has become increasingly aware of their impact on the environment which has created a market for environmentally friendly, or "green," products. This is seen in the fabric and textile industry via the re-emergence and introduction of eco-fibers. There are three fundamental types of eco-fibers that are commercially available: organic natural fibers, regenerated man-made fibers, and recycled synthetic fibers. Organic fibers are grown, cultivated and processed without pesticides, harmful chemicals, or synthetic fertilizers, and include organic cotton, organic linen, and organic wool. Regenerated fibers are made from natural resources and processed using green chemistry and clean state-of-the-art technology. These fibers consist of bamboo rayon, lyocell from seaweed, and azlons (regenerated proteins) made from corn, milk and soybeans. Synthetic materials, such as plastics, can be recycled into fibers, such as recycled polyethylene terephthalic acid (PET).

Eco-fibers are being used in all areas of the fashion industry, from retail stores such as the GAP to haute couture by Oscar de la Renta. Clothing is not the only use for these fibers, as they are also used in the manufacturing of footwear, handbags, toys, pillows, towels, beddings, carpets, and furnishings. As eco-fibers become more prevalent in society, they will undoubtedly make their way into crime scenes and require analysis by trace evidence examiners. Consequently, forensic scientists need to be equipped with appropriate analytical techniques and references to support their comparisons and conclusions, as well as the ability to identify counterfeit products (i.e., regular cotton marketed as organic cotton). Although the forensic characterization of eco-fibers has begun, there is no large scale collection of microscopical, spectrophotometric, chromatographic or chemical data of eco-materials.

This research focuses on the collection, analysis and characterization of several different eco-fibers. The characterization of these eco-fibers will be completed by polarized light microscopy, micro-melting point analysis, chemical staining, solubility, microscopical IR spectrophotometric analysis, micro-attenuated total reflection Fourier Transform (FT) IR spectroscopy, FT Raman spectrometry, dispersive Raman microspectroscopy, and pyrolysis-gas chromatography-mass spectrometry. The best discriminatory method and combination of methods for the characterization and differentiation of eco-fibers will be determined.

Fibers, Spectroscopy, Microscopy

 ** Presenting Author*