## A32 Elemental Analysis of Cotton Fiber Evidence using Solution ICP-MS and LA-ICP-MS

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After attending this presentation, attendees will understand the principles of Laser Ablation–Inductively Coupled Plasma/Mass Spectrometry (LA-ICP/MS), the importance and use of cotton fiber evidence in the field of forensic science and how elemental analysis can help distinguish cotton samples based on elemental composition.

This presentation will impact the forensic community by introducing a method for elemental analysis of cotton fibers for the purpose of increasing the discrimination between otherwise similar cotton evidence. Elemental analysis of cotton is also beneficial to customs and the USDA because it would add an additional source of information to assist in the geographic sourcing of cotton. The basis of the sourcing and differentiation is that cotton grown in different geographic regions of the United States (or the world) will have variations in trace metals due to soil nutrients, water content and type of fertilizers used.

Fibers are very common pieces of trace evidence found at a crime scene. Cotton is the most frequent type of fiber evidence encountered. This is due to the fact that a large amount of clothing is made from cotton. To date, analysis of cotton fiber evidence is limited to class characterization, color and perhaps fracture matches. Fracture matches are fairly uncommon and class/color characterization does much information for discrimination purposes.

Currently, no method for the elemental analysis of cotton for forensic use exists and the development of a method for elemental analysis of cotton could change the way fiber evidence is used in court in the future. Trace elemental content has the potential to provide additional discrimination between very similar fibers that would otherwise not be distinguished. Much of the cotton grown in the United States is exported to other countries for manufacturing and then imported back into the United States. Linking that exported cotton to certain geographical growing regions of the United States would allow verification of the source of the cotton. The USDA is also interested in elemental analysis of cotton because it would allow quality control to verify what the manufacturer reports on the label is what the clothing is actually made of.

A digestion procedure was developed and tested using solution ICP- MS analysis yielding good precision data (< 5% RSD) for most of the element menu (ie., Mg, Al, Mn, Pb, Sr, Ba, Fe). The method was then transferred to LA-ICP-MS for bulk analysis of a pellet made from a small amount (< 200 mg) cotton sample. LA-ICP-MS eliminates digestion/solution steps (reducing cost and exposure to hazardous materials), it's relatively non-destructive, uses minimal amounts of sample (300ng is actually introduced into the instrument for every analysis) and reduces analysis time. A comparison in precision and discrimination between conventional solution ICP-MS and LA-ICP-MS is presented. Approximately 50 white cotton samples of known geographic origins have been analyzed to determine the discrimination potential by elemental analysis and these results will be presented.

**Cotton, LA-ICP-MS, Elemental Analysis**

 ** Presenting Author*