



A95 Analysis and Potential Differentiation of Soot From Different Fuels Using Laser-Induced Thermal Desorption Fourier Transform Mass Spectrometry (LITD-FTMS)

Katherine Hutches, MSFS, Donald P. Land, PhD, and Diana Wang, University of California at Davis, One Shields Avenue, Davis, CA 95616*

After attending this presentation, attendees will have been familiarized with laser-induced thermal desorption (LITD) coupled with FT-MS, pyrolysis products of common fuels, soot formation mechanisms, and the application of LITD-FTMS for the analysis of soot deposited onto glass surfaces.

This presentation will impact the forensic science community by introducing its members to a new analytical technique and the potential applications of this technique to surface and soot analysis.

This study seeks to determine whether LITD-FTMS can be used as a tool for the analysis of soot deposited onto glass surfaces during compartment fires. Fire debris chemists have long recognized the presence of varying pyrolysis products from different fuels, such as styrene from polystyrene and nitrogen-containing compounds from polyurethane. If the soot and soot-adsorbed species that deposited onto glass surfaces were likewise different from one fuel to another, then it might be possible to differentiate between fuel sources, and possibly determine the order of deposition (and first fuel), using this surface-analyzing technique.

The deposits from polystyrene, flexible polyurethane foam, and gasoline have been analyzed and compared for visible "marker" peaks. Polyurethane is easily distinguished by peaks at m/z 122 and 148, which correspond to toluene diamine (TDA) and toluene aminoisocyanate (TAI) respectively. These are known pyrolysis products of flexible polyurethane foam, which is typically based on toluene diisocyanate (TDI). The polystyrene and gasoline deposits share many peaks in their mass spectra, which vary greatly with incident laser power density. High power densities yield mainly low- m/z peaks that may be attributed to the $^+$ ions predicted by the hydrogen-abstraction C H -addition

inseparable using only the markers noted in earlier portions of the study. It is noted that as successive laser shots are fired in the same location, the peaks from the topmost layer are often visible in spectra from later laser shots.

While the single-component samples are separable using this method, further method development will be required before this method can become a viable tool for the analysis of more complicated layered samples, which would be necessary for fire investigation. Towards this end, some initial analyses of single-component samples using principle component analysis will be presented.

Soot, Fourier Transform Mass Spectrometry, Laser