B50 Development of a Standardized Field Portable Extraction Gas Chromatography Tandem Mass Spectrometry Method for the Analysis of Ignitable Liquid Residues

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The goal of this presentation is to discuss the development of a field portable extraction and standardized gas chromatography ion trap tandem mass spectrometry (GC/IT/MS/MS) method for implementation in the detection and identification of ignitable liquid residues (ILR).

This presentation will impact the forensic community and/or humanity by increasing the sensitivity and selectivity that is necessary to detect minute amounts of ILR remaining after a fire and to differentiate ILR from IP. It is anticipated that the results using GC/IT/MS/MS will not require sophisticated training, longer analysis times, or data analysis programs.

The discovery and recovery of small amounts of ILR in fire debris evidence can be arduous owing to considerable loss of these compounds during the fire, extraction techniques that are not the most sensitive, coextraction of interfering products (IP), and analysis techniques that provide low discrimination. The main purpose of this project was to optimize a general method that can be used by examiners to improve current analysis of fire debris without significantly altering the workload or time required for analysis. In order to accomplish this goal uniform ionization parameters had to be established as well as chromatographic parameters.

Uniform ionization regions, called bins (chromatographic references), were created using the standard n-alkanes, C_8 through C_{23}, as markers. Alkanes elute from the gas chromatograph in a consequent order depending on boiling point and other factors. The method utilizes an alkane to produce bins that other ignitable liquids (IL) components elute into. The optimized parameters that best fit the IL constituent bin were put forth to evaluate components of interest away from IP thus weakening or even excluding interferences. Distinctive fragments, such as adduct ions, will be utilized to detect the alkane and label the bin. The bin method designed an undiversified and concentrated ionization zone that will result in reproducible mass spectra. Once the optimum MS/MS ionization parameters are selected for each bin, mass spectra will be compiled for IL components. Known IL standards and known weathered IL standards will be tested to generate reference examples using the MS/MS detector through the use of solid phase microextraction (SPME). These acknowledged IL standards will be investigated in the presence of IP, thus exemplifying the advantages, confirm the disadvantages, and establish the utility of this method.

This method is expected to increase the sensitivity and selectivity
that is necessary to detect minute amounts of ILR remaining after a fire and to differentiate ILR from IP. It is anticipated that the results using GC/IT/MS/MS will not require sophisticated training, longer analysis times, or data analysis programs.

Ignitable Liquid Residue, GC/IT/MS/MS, SPME

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