



B146 An Analysis of Ignitable Liquids Using Portable Ion-Trap Gas Chromatography/Mass Spectrometry (GC/MS) With Solid-Phase Microextraction (SPME) Sampling

David A. Matthew, MA, International Association of Fire Chiefs, USA, 10 Dickerson Lane, Napa, CA 94558; Pauline E. Leary, PhD, Smiths Detection, 1934 Bulls Head Road, Stanfordville, NY 12581; John D. De Haan, PhD, Fire-Ex Forensics, Inc, PMB 314, 3505 Sonoma Boulevard, #20, Vallejo, CA 94590; and Arlene M. Mc Grath, National University of Ireland Galway, Whitefield, Loughmore, Templemore, Tipperary, IRELAND*

After attending this presentation, attendees will better understand the impact samples, sampling time, and sampling conditions have on data that was collected at fire scenes and analyzed using portable GC/MS with SPME sample introduction.

This presentation will impact the forensic science community by informing attendees how portable GC/MS may be applied to fire investigations, as well as by demonstrating the advantages and limitations of performing this method.

The analysis of Ignitable Liquid Residues (ILRs) from a fire scene is performed to provide investigative leads, as well as to determine whether or not the crime of arson was committed. Typically, samples that potentially contain ILRs at a fire scene are identified, collected, packaged and transported to the laboratory for GC/MS analysis. Determination of the presence of an ILR is achieved by the evaluation of GC patterns and by the conclusive identification of individual components present in the sample using both GC and MS data. There are many challenges to the successful performance of this type of analysis. Proper sample identification, collection, packaging, and transport are critical. If these tasks are not performed correctly, results of analytical testing may be meaningless or even misleading. In addition, laboratory backlog may delay analytical turnaround time. As a result, data may not be representative of the sample collected. This is because the longer these volatile and semi-volatile samples are stored, the more likely they are to change their chemical composition and, therefore, their chromatographic profile. This can significantly complicate the interpretation of the analytical data from the collected sample.

For these reasons, it may be desirable to take the analytical laboratory to the field and perform GC/MS during the fire scene investigation as the quality of the sample is at its greatest at the scene. Results are characteristic of the sample collected before storage and time have had a chance to alter its chemical composition. In addition, when analysis is performed at the scene, investigative leads are available in near-real time. Also, the use of portable GC/MS will prevent the submission of poorly collected samples to the laboratory for analysis. Portable GC/MS can be used to establish the presence of an ILR at the scene, preventing the submission of negative samples to the laboratory.

There are a number of different portable GC/MS systems available to perform field analysis. These systems vary based on the type of GC column and mass analyzer used, as well as how the sample is collected and introduced to the system. These factors can play a critical role in the chromatogram collected and, therefore, impact data interpretation. It is important that factors such as sampling conditions, as well as degree of sample weathering, impact the chromatogram generated before a method is applied to this type of evidence.

For this research, a portable ion-trap GC/MS with an SPME sampling accessory was used to analyze ILs representative of a range of different classes of these compounds. The portable GC-MS system used weighs less than 15kg and is designed for use in the field. Sampling was performed using SPME. Ignitable liquids



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tested included lighter ILs such as gasoline and paint thinner, as well as heavier ILs such as diesel and kerosene. Testing was performed to determine the impact sampling time and degree of sampling weathering had upon the resulting chromatogram. This is critically important because an understanding of these effects is necessary if proper interpretation of GC/MS data is to be achieved.

Results revealed that the chromatograms recovered from an IL are dependent upon many factors, including degree of aging of the sample, the type of IL analyzed, and other sampling conditions. A summary of the data will be presented so an understanding of how these factors impact the data may be understood. A discussion of the analytical advantages and disadvantages to the method will also be included. Attendees will understand the variability they should expect to see in the data should this method be applied in the field to samples collected during a fire scene investigation.

Portable GC/MS/SPME, Ignitable Liquid Residue, Arson