## B176 The Utilization of Portable Gas Chromatographic (GC) Systems Coupled With Capillary Microextraction of Volatiles (CMV) for On-Site Detection of Ignitable Liquid Residues (ILRs)

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**Learning Overview:** After attending this presentation, attendees will be familiar with the performance capabilities of current generation portable Gas Chromatograph/Mass Spectrometers (GC/MS) as applied to fire investigations.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by highlighting the advantages and disadvantages of the systems and the extraction techniques presented here, which would be particularly helpful to fire scene investigators and fire debris analysts.

Laboratory methodologies for the detection and analysis of ILRs in fire debris are well-established; however, methodologies pertaining to on-scene detection and identification are less defined. Instrumentation, such as hydrocarbon "noses," have not been widely utilized due to a lack of specificity and have instead been surpassed by ILR-trained canines. Thanks to recent advancements in miniaturized hyphenated systems, the potential for rapid and more accurate on-site detection of ILRs exists. With the growing availability of these portable systems on the market, there is now a need to evaluate their effectiveness in the field relative to traditional laboratory methods.[1]

In this study, two portable GC/MS systems, the TRIDION™-9 and the Griffin™ G510, are applied to the analysis of ignitable liquid residues recovered from fire debris. Both systems are low thermal mass GCs; the TRIDION™-9 utilizes a toroidal ion trap as its detector while the Griffin™ utilizes a linear quadrupole. The instrument inlets are configured to allow Solid Phase Microextraction (SPME) sampling in addition to other sampling techniques. Other commercially available accessories available from both instrument companies also allow for the coupling of the CMV device. The CMV is a dynamic headspace sampling device which consists of a dual open-ended capillary tube filled with glass microfiber strips that are coated in a Polydimethylsiloxane (PDMS) -incorporated sol-gel polymer. The CMV can be thermally desorbed by direct insertion into a GC/MS inlet and has had successful applications to several materials of forensic interest.[2-4]

The two instruments are evaluated using several points of comparison. Chromatographic resolution, software identification capabilities, overall time of analysis, and ease of use are evaluated. The figures of merit for each system are also compared to those of a benchtop GC/MS system. Method development and optimization is carried out using standardized accelerant mixtures. Simulated debris sampling is carried out in three scenarios: closed-system using 1L steel paint cans or paper cups with various charred substrates, and open-system using a calibrated vapor source. The techniques used for sampling include SPME fibers and the CMV with their recovery capabilities compared across all three systems. Finally, both systems have been utilized onsite at an accelerated live-burn exercise, and the results of this exercise are also presented.

**Reference(s):**

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3. Wiebelhaus, N., Hamblin, D., Kreitals, N.M., and Almirall, J.R. Differentiation of Marijuana Headspace Volatiles from Other Plants and Hemp Products Using Capillary Microextraction of Volatiles (CMV) Coupled to Gas-Chromatography–mass Spectrometry (GC–MS). *Forensic Chemistry.* 2016. 2: 1-8.
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**Fire Debris Analysis, Headspace Sampling, Portable GC/MS**



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