B124 Determining the Threshold of Identification Via Gas Chromatography/Mass Spectrometry (GC/MS) of Weathered Gasoline Extracted From Nylon Carpet

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After attending this presentation, attendees will understand how the amount of weathering a gasoline sample undergoes can impact the threshold of identification for GC/MS for ignitable liquid analysis.

This presentation will impact the forensic science community by establishing a method for determining the threshold of identification for ignitable liquids. This method may be used to optimize GC/MS instrument analysis, allow for comparison of data between instruments, and eventually let a minimum threshold of identification be set and become part of quality assurance programs.

The Organization of Scientific Area Committees (OSAC) defines the threshold of identification as the minimum concentration of ignitable liquid that can be identified from GC/MS spectra using accepted pattern identification criteria. A method for determining this threshold for ignitable liquids has not been established. Variation in the ion ratios of weathered gasoline samples has also not been investigated.

Due to its frequent use as an accelerant, gasoline was used as the ignitable liquid in this study. Weathered gasoline samples were used because they are more representative of what is recovered from arson scenes.

Neat gasoline samples were weathered to varying percents (50%, 75%, 90%, and 99%) by volume. All samples were prepared in duplicate. A system blank and a positive control were also prepared alongside the samples. The nylon carpet matrix was prepared by burning the substrate for ten seconds with a blow torch. The burned carpet samples were spiked with gasoline and an internal standard. The spiked carpet was then extracted using passive headspace according to the American Society for Testing and Materials (ASTM) 1412. The carbon strips were desorbed using carbon disulfide.

GC/MS analysis, using an Agilent® 7890a GC with a 5975C MS, was performed in this study. A temperature program consistent with ASTM 1618 was used to analyze the samples.

Data was interpreted by examining the ratio of the base peak area counts to the qualifier ion area counts for ten target compounds. The area counts for the internal standard were used to correct for instrument variation. Target compounds were chosen based on ASTM 1618 guidelines and compounds that would still be present in a largely weathered sample. The chosen compounds were dodecane, 1,2,3,-trimethylbenzene, 2-ethyl-1, 4-dimethylbenzene, 1-ethyl-2,4-dimethylbenzene, 1,2,3,4-tetramethylbenzene, 1-methyl-indane, 3-phenylbut-1-ene, naphthalene, and 2-methyl-napthalene. Neat gasoline peak ratios were used to establish an acceptable range for the peak ratios of the weathered samples. The acceptable range was considered to be within ±20% of the neat gasoline peak ratio.

GC/MS, Arson, Threshold of Identification

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