



B152 Determining the Effects of Storage Conditions on the Preservation of Ignitable Liquid Residues

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After attending this presentation, attendees will understand to what extent different factors influence the preservation of stored ignitable liquid residue samples.

This presentation will impact the forensic science community by providing fire debris analysts with data to support which storage factors are important to consider when the preservation of samples is desired.

Preservation of ignitable liquid residue extracts is necessary for possible re-examination of suspected fire debris samples. Preliminary research investigating the effects of storage has been completed previously, although many aspects of storage have not yet been addressed.¹⁻³ The work completed by Sandercock provided foundational preservation research; however, this research will examine a wider range of factors.² In this study, Gas Chromatography/Flame Ionization Detection (GC/FID) was used to evaluate the extent to which select storage factors influence the preservation of fire debris samples over a 30-day period. A test mixture was created containing approximately 20 compounds commonly found in ignitable liquid residues. An aliquot of the test mixture was deposited into a metal can and adsorbed onto charcoal strips through active headspace. Chromatograms between the initial time-point and 30 days after analysis were compared to understand the relative effects of the storage conditions.

A partial factorial Design of Experiments (DOE) was used to evaluate the effects of different storage factors on the ability to preserve the sample. The six factors considered were: vial type (screw cap vs. crimp cap), storage temperature (23°C vs. -4°C), method of sample concentration (ambient evaporation vs. dry nitrogen stream), extraction solvent (carbon disulfide vs. pentane), whether the sample vial was stored in a vapor-tight fire debris bag, and whether the vial was covered with Parafilm®. This partial factorial design was replicated across the different methods of preservation suggested in the American Society for Testing and Materials (ASTM) E2451 *Standard Practice for Preserving Ignitable Liquids and Ignitable Liquid Residue Extracts from Fire Debris Samples* (i.e., reconstitution of the sample onto a charcoal strip vs. cutting the strip in half).⁴

The results of this study will be used to understand the relative effects storage factors have on the preservation of ignitable liquid residue extracts and will provide a platform to both continue future work on preservation and allow analysts to make informed decisions on archiving and preserving casework. Sample preservation can be an important step in a suspected fire debris case and this research will provide analysts with insight into critical preservation factors and the effect the factors have on the data.

Reference(s):

1. L.V. Waters, L.A. Palmer. Multiple analysis of fire debris samples using passive headspace concentration. *J. Foren. Sci.* 38 (1993) 165-183.
2. P.M.L. Sandercock. Retention of gasoline and diesel fuel samples on charcoal: evaluation of long term preservation of petroleum residues. *Can. Soc. Forens. Sci. J.* 4 (1997) 219-224.
3. C.M. Fried, T.A. Brettell. An Investigation Into the Preservation and Storage Conditions for Extracts of Ignitable Liquid Residues. *Proceedings of the American Academy of Forensic Sciences*, 69th Annual Scientific Meeting, New Orleans, LA. 2017. B55.
4. E2451-13. Standard Practice for Preserving Ignitable Liquids and Ignitable Liquid Residue Extracts from Fire Debris Samples. ASTM International, 2013.

Fire Debris, Ignitable Liquid Residues, Preservation