B119 Identification of Ignitable Liquids in the Presence of Interfering Products in Fire Debris Analysis

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After attending this presentation, participants will understand the challenges of identifying ignitable liquids from interfering products found in fire debris. A methodology for producing interfering products from pyrolysis and combustion of common building and furnishing materials has been established. The covariance mapping method developed determines the contribution of interfering products and ignitable liquids in the fire debris.

The presentation will impact the forensic community by presenting methodologies to aid fire debris analysts in the identification of ignitable liquids in the presence of interfering products in fire debris. The development of an internet accessible GC-MS database will provide fire debris analysts a tool in evaluating fire debris in their casework.

The fire debris analyst is often faced with the complex problem of identifying ignitable liquid residues in the presence of interfering products from pyrolysis and incomplete combustion of common building and furnishing materials.[1] The purpose of this research was to develop a modified destructive distillation methodology to produce interfering product chromatographic patterns similar to those observed in fire debris case work and to establish an internet accessible GC-MS database tool for fire debris analysts to use in the evaluation of casework data.

The method developed under this research for producing interfering products involved placing a known mass of material in a one-quart paint can (unlined), placing a lid containing a small number of 1 mm diameter holes loosely on top of the can, and applying heat to the bottom of the can with a propane torch. Temperatures at the bottom of the can and in the headspace were monitored and recorded during the burn. Parameters that were varied for method optimization included the size and mass of the substrate, the burn time, and the distance from the flame to the bottom of the can. The volatile products generated during the heating period were evaluated by passive headspace analysis and the effect of the variable parameters on the product profile was determined. A set of parameters were identified to optimize the pyrolysis-like interfering products obtained from the substrate and minimize the combustion-like products.

The substrates examined in this research included carpets made of nylon, polyester, P.E.T. polyester, olefin, UV olefin, olefin/nylon blend, and a polyester nylon blend, and one carpet padding. Additional substrates included various woods including maple, oak, poplar, white and yellow pine, aspen, alder, hickory, cedar, cherry, and Douglas fir. Along with the previously mentioned carpets and woods, low density polyethylene (LDPE), industrial vinyl, vinyl/linoleum, laminate hardwoods, and bamboo hardwoods were burned.

Substrates were also burned in the presence of ignitable liquids and the resulting sample analyzed by passive headspace analysis. The covariance mapping method developed at NCFS was used to model data sets as a combination of substrate-generated interfering products and ignitable liquids.[2,3] The covariance method was able to determine the contribution of the substrate and ignitable liquid.

This research was supported by the National Institute of Justice, Office of Justice Programs under award 2005-MU-MU-K044. The research was undertaken in collaboration with the Bureau of Forensic Fire and Explosive Analysis and conducted at the National Center for Forensic Science, a member of the Forensic Resource Network. Views presented do not reflect the position of the government or infer endorsement.

References:

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Fire Debris, Interfering Products, Ignitable Liquids

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