D21 Field Sampling and Analysis Methods for Arson Investigation

Laura M. Conner, BS, and Kenneth G. Furton, PhD, Florida International University, University Park, Department of Chemistry and Biochemistry, Miami, FL 33199*

After attending this presentation, attendees will be briefed on new methods for sampling from a suspected arson scene.

This presentation will impact the forensic community and/or humanity by demonstrating new and more efficient methods of sampling will improve analysts' ability to successfully investigate suspected arson cases.

Arson is a serious crime resulting in hundreds of deaths and billions of dollars in property damage per year. Separation of these accelerants from fire debris can be difficult and inefficient. This study examines the performance of a commercially available instrument that uses dynamic headspace concentration to remove possible ignitable liquid residues from debris and store them in an adsorbent filled tube. A pump draws air from a heated debris chamber into the tube. The volatile compounds in the debris will adsorb to the material. The pre-packed tubes contain charcoal or polymer beads as an adsorbent. Use of this instrument in the field potentially eliminates the need to transport large volumes of debris to the laboratory. Traditionally, debris is collected in paint cans and need to be stored until they can be analyzed. Twenty of the tubes used in this instrument can easily be carried in a shirt pocket. Compounds are removed from the adsorbent by solvent desorbtion and can then be analyzed using gas chromatography/mass spectrometry.

Much interference occurs in arson debris samples. Extraction solvents and background, pyrolysis and combustion products from the material can complicate the process and lead to false positive or negative results. The data analysis methods used are intended to help confirm or exclude the presence of an accelerant in a suspected arson sample, despite these interferences. The spectra are examined for the characteristic patterns of known accelerants. Care must be taken in this process as interfering substances and fire conditions may obscure some of the data.

Samples have been collected and tested to show the efficiency of the portable system both in the presence of a complex debris matrix, such as carpet and padding, and without. Experimental accelerants used include diesel fuel, lighter fluid and a simulated arson mixture. The simulated arson mixture, or SAM, is made up of a range of alkalines and various aromatics encountered in common accelerants. The substances chosen cover the volatility range of common ignitable liquid residues in order to express any inefficiency in the collection range of the portable sampler.

This instrument has demonstrated ability to concentrate small amounts of accelerants spiked onto a matrix. Also, electronic noses are evaluated for their ability to detect the presence of accelerants in specific areas of a scene. These small battery operated instruments give a reading of the amount of VOC's present in air. In this way, they can be used to scan a scene for areas of interest. Accelerant detecting canines can be used for the same purpose. However, canines can be limited in their operating time and ability to work in hazardous scenes. These instruments, while possibly not as accurate as canines, can be inexpensive and do not require a highly skilled operator. The instruments were studied for their abilities to detect various types of compounds. Substances such as diesel fuel, lighter fluid, and a SAM mixture were tested with and without the carpet and padding matrix. Interfering substances can cause difficulties with these types of instruments. However, when used as a preliminary indicator of where to sample, they have shown to be useful.

Arson, Adsorption, Sampling

 ** Presenting Author*