A117 Ignitable Liquid Residue Distribution in Pour Patterns as Affected by Substrate Type and Ignitable Liquid Class

Bob Sullivan, Cabell County Prosecutor's Office, 6007 US Route 60 East, Suite 109, Barboursville, WV 255504; and J. Graham Rankin, PhD, and Dana L. Greely, BS, Marshall University, Forensic Science Program, 1401 Forensic Science Drive, Huntington, WV 25701*

The goal of this presentation is to present the effects of substrate type on the migration of ignitable liquids in a pour pattern during a fire and to present the best place to collect an evidence sample from in each case.

This presentation will impact the forensic science community by providing fire investigators with an expanded knowledge of the primary areas to sample from a suspected ignitable liquid pour pattern on various substrates in order for the fire debris analyst to obtain the best results in the lab.

Collection of fire debris evidence from a fire scene most commonly falls on the shoulders of the fire investigator in charge of the scene. The sample is then sent to the lab to be analyzed by a fire debris analyst for the presence of ignitable liquid residues. For the best chromatographic results, the evidence samples must be collected from an area of the pour pattern suspected to contain the highest concentration of ignitable liquid residue. The question is whether it is best to collect from the center of the pour pattern, the edges of the pour pattern, or somewhere in between.

One factor to consider is whether the substrate the ignitable liquid was poured onto has any effect on the prime area to collect the sample from. Carpeting, for example, can wick the ignitable liquid away from the original pour pattern diluting the ignitable liquid over a larger area. Some newer synthetic carpets can also self-sustain combustion beyond the edge of the original pour pattern leaving a completely unrelated pattern. Sampling from the edge of this pattern could potentially give negative results. Also, different types of wood may absorb the ignitable liquid allowing for a deeper burn pattern while others may resist it allowing the ignitable liquid to spread farther and burn faster with little effect on the substrate.

An experiment was designed to test the concentrations of ignitable liquid residues in different specified areas of pour patterns post-burn. A circular pour pattern representing a central dump of the ignitable liquid was tested, as well as a line pattern representing a trail pattern. Substrates were allowed to burn to 70% completion and were extinguished with water. Multiple samples were collected at designated areas across the pattern. Any volatile ignitable liquid residues present were collected by passive headspace analysis on activated charcoal strips and submitted to analysis by GC/MS. Total ion chromatograms for each sample were analyzed qualitatively and quantitatively. The ratio of the total peak area to that of the internal standard, 3-phenyltoluene, was calculated and compared.

Initially, the results have shown that higher concentrations of ignitable liquid residues can be found toward the center of the pour patterns than toward the outer edges under these conditions. This would suggest that the center of a pattern would be the best place for fire investigators to sample from for the best results. Differences in relative concentration of ignitable liquid residue due to substrate, actual pour pattern, and class of ignitable liquid will be presented.

Fire Debris Analysis, Pour Pattern, Ignitable Liquid

 ** Presenting Author*