



Detection of Accelerants in Arson Residues using Thermal Desorption-GC/MS

Application Note

Forensics

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When arson is suspected with a fire of unknown origin, the remaining residues are examined for traces of flammable accelerants. Typical accelerants include the common gasoline, kerosene and diesel, as well as less common flammable solvents as methanol or naphtha. Most common accelerants (except methanol) have complex chemical profiles consisting of hundreds of aliphatic and aromatic peaks. They also all produce a characteristic profile using GC or GC/MS. They all have low boiling as well as high boiling volatile fractions. Combustion leaves only the higher boiling semivolatile fingerprint. These semivolatiles are usually left in the debris and can be detected using thermal desorption or dynamic headspace techniques interfaced with either GC or GC/MS.

Samples of seasoned softwood were cut up into small pieces (2cm x 2cm x 0.5cm). A few pieces were put in a small metal tray to which was added about 8-10ml of accelerant. The wood was in contact with the accelerant for about 5-10 minutes before ignition. The fire continued until the excess accelerant was consumed and the wood was charred. The fire was then extinguished by placing a piece of sheet metal into the fire tray. After allowing the fire to cool, the charred portions of wood were scraped off and about 50mg of uncharred wood sample was placed in a empty thermal desorber tube, which was desorbed using a Dynatherm 9300. The 9300 was interfaced to a GC/MS system. Accelerants used included gasoline, kerosene, and diesel fuel.

The chromatograms provided are for gasoline and kerosene standards spiked onto a paper tissue, showing low boiling as well as a complexity of medium and high boiling components. The third chromatogram shows a peice of debris analyzed by dyanamic headspace. The resultant chromatogram while missing the low boiling components shows a perfect profile for gasoline which was clearly identified as the accelerant for the fire.

CDS Autosampler Dynatherm 9300

Valve Oven: 130°C
 Transfer Line: 130°C
 Tube Heat: 100°C 1 minute
 Trap Heat: 300°C 5 minutes

When using an empty thermal desorption tube for "headspace" analysis, it is important to not heat a sample past its melting point.

GC/MS

Column: CP-Select 624
 (30m x 0.25mm x .1.4µm)
 Carrier: Helium, 50:1 split
 Injector: 300°C
 Program: 30°C/3.2min, 8°C/min to 200°C
 hold 1 minute

