

TECHNICAL NOTE

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Quick Test for Accelerants after Steam Distillation

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ABSTRACT: Gage-O[®] paste for gasoline detection is placed on a 3-mm diameter glass rod and inserted for 30 s into the water-organic interface of the distillate in the Barrett receiver after steam distilling the suspected residue. If accelerants such as gasoline, turpentine, paint thinner, or brush cleaner are present, a small white line, which fluoresces intensely with long wavelength ultraviolet radiation, appears. The remaining accelerant can be confirmed by separation with gas chromatography.

KEYWORDS: criminalistics, accelerants, arson

In a suspected arson, the criminalist is often presented several cans or jars of debris to determine if an accelerant is present. For those investigators that prefer the steam distillation technique [1-6] for the initial separation of accelerants in suspected arson cases, a screening method to determine those samples that are worth following up with a gas chromatographic separation would save considerable time. The accelerant film on top of the water layer is often so thin that it is not always visible. Rather than spend time trying to further concentrate, collect, and perform a gas chromatographic separation for material that may not be there, a quick method was desired to determine if accelerants were in fact present.

Previous experience by the authors with a paste developed to detect gasoline in well water (Gage-O[®] gasoline) indicated that it might also be used for detecting gasolines and other accelerants in the steam distillate. It was believed that if this compound was placed on the surface of a small glass rod and inserted into the top of the water layer, this should work quite well to provide a rapid detection of small quantities of accelerant, either by the appearance of a thin white band at the interface, or in the very trace situations, by the intense fluorescence of the white band when exposed to long wavelength ultraviolet radiation.

This would have several advantages: (1) a visual confirmation of the possible presence of accelerants could be made immediately which could be photographed as evidence, (2) the fluorescence could also provide evidence the possible presence of accelerants and be photographed as evidence, (3) there would be no need to spend time doing the gas chromato-

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graphic separation on the negative samples if positive results occurred somewhere in the series, and (4) if positive results occurred, then there may be sufficient accelerant present in the water layer for the usual gas chromatographic techniques to identify the type of accelerant used.

Experimental Procedure

Chemicals

Gage-O Paste—This is a paste prepared by The Petroleum Speciality Co., Division of Tarthang Technics, Inc., Box 1278, Los Angeles, CA 94701. It contains the blue dye 2,6-bis(isopropylamino) anthraquinone (Solvent blue 36), corn syrup, castor oil, glycerine, and calcium carbonate. A thin film of this paste was placed around a 3-mm diameter glass rod for a length of about 2 cm. The dye is available commercially from Keystone Aniline and Chemical Co., 2501 W. Fulton St., Chicago, IL 60612.

Accelerants—Turpatene[®], Parks Corp., Somerset, MA 02726 (a blend of terpenes). Leaded gasoline, Farmer's Co-op, Manhattan, KS. Paint thinner, (100% mineral spirits), Parks Corp., Somerset MA 02726. Brush cleaner, (Kwikeeze[®] water rinsing brush cleaner), contains toluene, methanol, methylene chloride, and acetone, the Savogram Co., Norwood, MA 02062 and Addison, IL 60101. PMO stove and lantern fluid, Parker Oil Co., Inc. Wichita KS 67203. Kerosene, Farmer's Co-op, Manhattan, KS. Diesel fuel No. 2.

Blank Materials—Burned pieces of pine wood 1.75 by 8.8 by 1.5 cm.

Apparatus

Steam distillation apparatus consisting of a single neck, 45/50, 1-L round bottom flask fitted with a series of adaptors, a Barrett returnable type receiver, and a West condenser.

Ultraviolet (UV) Lamp—Mineralight[®], UVS-11, (long wavelength, 366 nm), Ultraviolet Products, Inc., San Gabriel, CA.

Gas Chromatograph—Tracor Model 560 fitted with a flame ionization detector (FID). The column was 1.8 m by 3 mm stainless steel (SS) packed with 10% SE-30 on 80-100 mesh Chromosorb W acid washed.

Procedure

Approximately 10 mL of each test accelerant was added to individual pine boards and ignited. The boards were permitted to burn until they burned out. Each partially burned board was then individually placed into the flask, 500 mL of water added, and the system distilled for 3 to 4 h. The design of the trap (water out of the bottom and returned to the flask) prevents the separated accelerant from being returned to the flask. The condenser was removed from the receiver and the coated glass rod immersed into the water layer until about 2 cm of the dye was covered. The rod should be held steady and not allowed to move up and down. The interface area was carefully watched for signs of the dye moving upward and for the appearance of a thin white line indicating the presence of an accelerant. A 30-s exposure is sufficient. A longer exposure can remove so much material that further gas chromatographic analysis may not be possible. The rod was removed and inspected; first under normal room lighting, then under long wavelength (366-nm) UV radiation in a darkened room or in a black box.

If this examination indicated the presence of accelerants, then the standard techniques were followed on the remainder of the sample.

Results and Discussion

The time allowed for dipping the rod into the liquid is quite important. Early experiments indicated that if more than 45 s were used then the less viscous samples such as gasoline were all absorbed on the paste. While this produced the white band, it would not allow for a subsequent chromatographic investigation. Thirty seconds appears to be the optimum time.

The following substances gave positive results under the test conditions: turpatene, leaded gasoline, paint thinner, brush cleaner, and PMO lantern fluid. Gasoline, turpatene, paint thinner, and the brush cleaner also produced a gas chromatographic pattern on the remainder of the material. Attempts to remove the adsorbed accelerants from the rod for further identification have not been successful.

Under the test conditions in which all samples were treated the same, kerosene and diesel fuel did not respond. This is probably due to the fact that these are too viscous to act as a rapid mobile phase for the thin-layer chromatographic-(TLC) type mechanism believed to be taking place.

A blank was tested to determine if there would be natural oils, resins, and combustion products in wood that would produce a false positive. Burned and unburned pine boards were tested individually and no positive tests were obtained nor did they produce a gas chromatographic pattern when tested the same as the samples.

An estimate of the detection limit was made by adding a measured amount of either gasoline or paint thinner to 10 mL of water and shaken. After allowing 15 min for the emulsion to break, the rod test was performed. Positive tests were obtained with 5 μ L but not with 1 μ L. This is therefore less sensitive than a gas chromatographic detection.

It is believed that the mechanism of the reaction is a thin-layer chromatographic separation of the dye from the carbonate and starch support with the accelerant acting as the mobile phase. This is why the rod should be held steady and not moved up and down during the detection phase of the operation. A component or components in the corn syrup fluoresce and the blue dye quenches this fluorescence.

References

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