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A SEMI-MICRO METHOD FOR FLASH POINT DETERMINATION

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Knowing the flash point of a liquid involved in an arson investigation may be of considerable help to the investigator. In addition to showing the degree of flammability of the liquid, it may help identify the material or show the presence of adulterants. Frequently, the amount of liquid available will be quite limited; thus, the problem has been to obtain reasonably accurate results using the small amount of sample which may be received in such investigations.

A procedure has been developed that gives results comparable to those obtained by the standard open cup flash method and only requires about a milliliter of sample. This procedure is simple and rapid, and the equipment is readily available although requiring slight modification. The method is based on the premise that a small amount of liquid will rapidly reach temperature equilibrium with a surface upon which it is placed. Measurement is made of the temperature of the surface and not the liquid.

The equipment used consists of an aluminum melting point block,[1] as illustrated. This block has had a slight depression, approximately 1/32 inch deep and 3/4 inch in diameter, cut into the top surface with a lathe; however, these dimensions are not critical. An electric hot plate with a variable control is used for heating, and a standard open flash thermometer (ASTM #11F) is used for temperature measurement. The thermometer is twelve inches long with one inch immersion and has a range of 20° F to 760° F in 5° divisions.

When making a determination, it is generally possible to estimate the approximate flash point from the odor and appearance of the sample. The melting block is then heated to a temperature on the hot plate near the estimated range of the flash point. A large drop of the liquid is placed in the depression on the top of the melting point block and a small open flame passed back and forth approximately 1/4 inch above the surface of the liquid for approximately five to ten seconds. (figure 1). Care must be taken not to heat or touch the liquid with the open flame. In subdued

Figure 1
Modified Melting Point Block Used for Flash Point Determination.

[1] Available through Microchemical Specialties Co., 1834 University Avenue, Berkeley, 3. California (Catalog Number 6200).

light, the flash is easily observed. The test should be conducted in an area where there is little or no draft. If the flash is observed, the temperature is noted and then lowered in at least five degree increments until a temperature just below the flash point is found. At each temperature that an observation is made, a fresh drop of liquid must be used. The block must be cleaned between samples by wiping off any residue left. If the liquid does not flash at the initial point of observation, the temperature is raised until a point is reached where the flash can be observed, again changing the temperature in at least five degree increments and using a fresh drop each time. With a little practice, it is possible to estimate the amount of change in temperature necessary to reach the vicinity of the flash point by observing the action of the liquid on the melting block. Near the flash point, the liquid will spread more rapidly, and frequently, small bubbles will be observed. Above the flash point, the liquid will normally ignite rather than flash. No attempt has been made to check the accuracy of this method in determining the fire point of a liquid.

The procedure has been found to be about as simple to learn as the standard open cup flash point method. A number of known liquids have been checked, and the results compare favorably with the data on flash points in the handbooks. However, each operator should make his own correlation between known liquids and observed results. The degree of accuracy obtained has been found to be generally sufficient for arson investigations. With practice, the size of the sample needed for the complete determination can be reduced below a milliliter. Frequently, four or five drops is all that is necessary.

This method has been found to be of value not only because it is reasonably rapid and accurate but also because it requires only a small sized sample of volatile fluid and limited equipment which is generally available in the police laboratory.