CASE REPORT

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Trioxane—An Unusual Component in an Improvised Explosive-Actuated Incendiary Device

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ABSTRACT: Purple granules were found as an adulterant in a specimen of double-based smokeless powder that had been obtained from an improvised explosive-actuated incendiary device. These granules were identified as having originated from tablets used by the U.S. Army in heating rations in the field. Trioxane, the active ingredient in these tablets, was identified by infrared and proton magnetic resonance spectroscopy.

KEYWORDS: criminalistics, explosives, spectroscopic analysis, incendiary, powder, trioxane, infrared spectroscopy, nuclear magnetic resonance spectroscopy

Approximately one week before the explosion at the 1980 Munich Octoberfest, an improvised explosive-actuated incendiary device was discovered at a U.S. Army missile repair facility in West Germany. The device consisted of a 3.8-L (1-gal) can of gasoline, to which was taped approximately 250 g of double-based smokeless powder activated by a battery and alarm. The smokeless powder contained an adulterant which consisted of numerous purple granules. These granules were identified as having originated from heat tablets used by the U.S. Army (Fig. 1) and designated "Fuel, Compressed. Trioxane Ration Heating—Mil-F-10805D."

Trioxane, $C_3H_6O_3$, consists of a six-membered ring of alternating oxygen and methylene groups. It is a crystalline solid that melts at 64°C [*1*] and sublimes readily. Extraction and identification of the trioxane in the granules was simple. The purple granules were dissolved in diethyl ether, which was then passed through activated charcoal. Evaporation of the clear solvent produced white crystals of trioxane. Figure 2 shows the infrared (IR) spectrum of ex-

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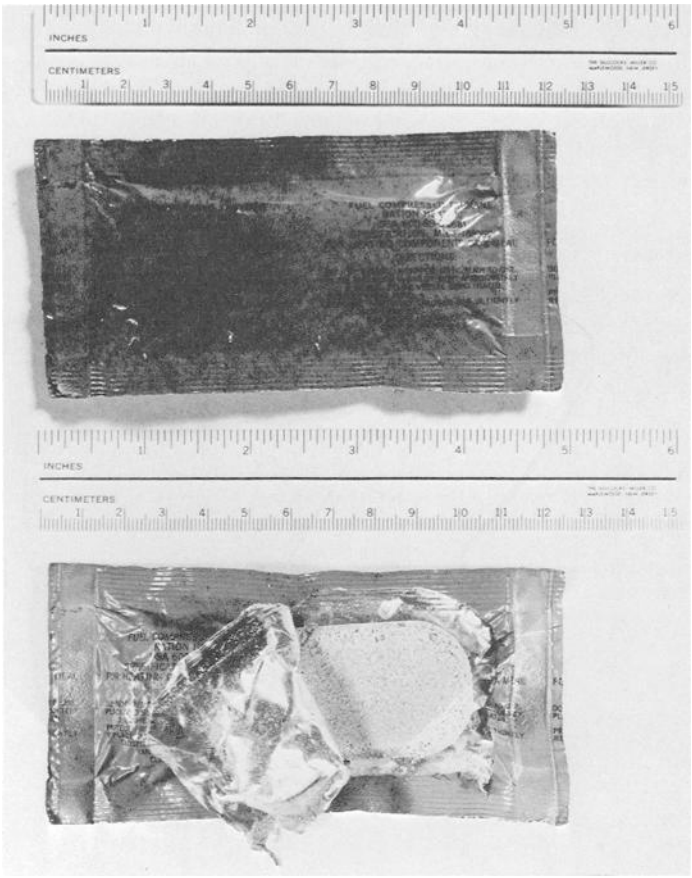

FIG. 1—*U.S. Army heat tablets.*

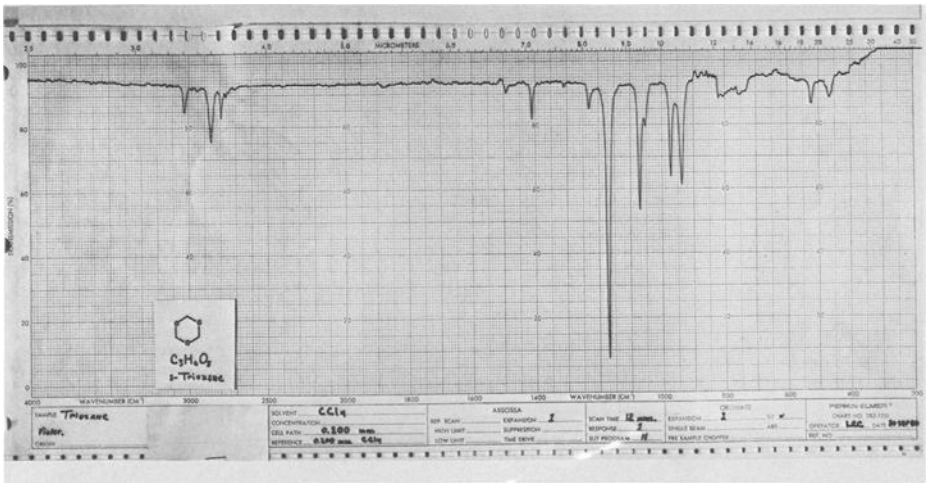

FIG. 2—*Infrared spectrum of extracted trioxane.*

tracted trioxane in carbon tetrachloride in a 0.2-mm cell on a Perkin-Elmer 283B IR Spectrophotometer.

The identification of trioxane was further verified through proton magnetic resonance (PMR) spectroscopy. At ambient temperatures all six protons should be equivalent, and thus the PMR spectrum should consist of a single peak. Shoolery's additive constants [*2*] predict a chemical shift of around 5 ppm. The PMR spectrum was recorded in deuterated chloroform on a Nicolet NT 200 and produced a single peak at 5.156 ppm.

Acknowledgments

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