TECHNICAL NOTE

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On the Examination of the Military Explosive, C-4

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ABSTRACT: A technique is described for the analysis of the plastic explosive, C-4. The method involves a chloroform extraction of the sample and an infrared examination of the extract. Problems that may be encountered in attempting to identify C-4 are discussed and solutions to these problems are proposed.

KEY WORDS: criminalistics, explosives, spectroscopic analysis

A sample believed to be C-4, a plastic explosive, was examined by techniques described by Midkiff and Washington [*1*] and a complex infrared spectrum (Fig. 1) was obtained for the plasticizer. The technique involves a chloroform extraction of the sample followed by an infrared (IR) examination of the extract for the presence of the plasticizer, di(2-ethylhexyl) adipate (DOA) or di(2-ethylhexyl) sebacate (DOS) (Fig. 2).

The components of C-4 (see Table 1) can be separated by dissolution in chloroform (for

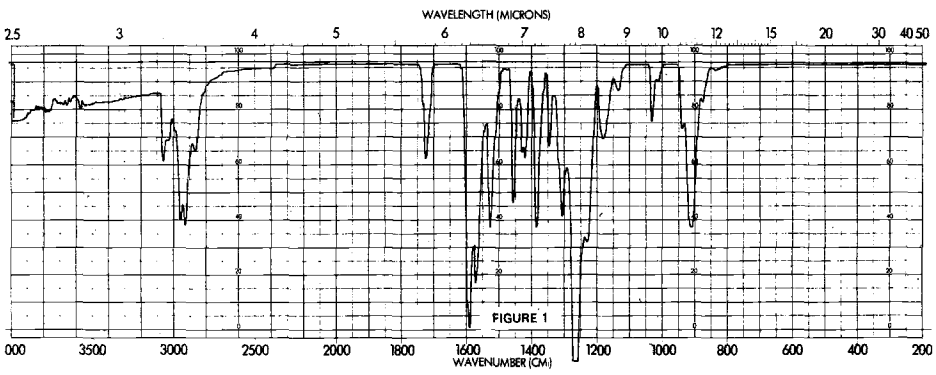

FIG. 1—*Turbid chloroform extract of C-4.*

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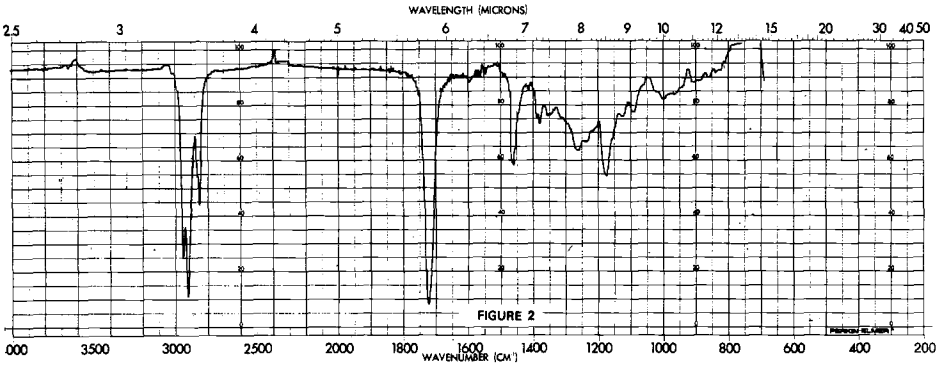

FIG. 2—*Chloroform solution of DOS.*

TABLE 1—*Composition of C-4.*[a]

Compound	%
RDX	91.00
Motor oil	1.60
Plasticizer (DOS or DOA)	5.30
Polyisobutylene binder	2.10

[a]Source: Department of the Army Technical Manual TM-9-1300-214/Department of the Air Force Technical Manual TD 11A-1-34 (joint publication), Nov. 1967.

binder/additives) and acetone (for explosives). When performing a rapid analysis of C-4, one may find that the spectrum of the chloroform extract is not readily identified as that of DOA or DOS. This problem is caused by the suspension in the chloroform extract of exceedingly small particles of cyclotrimethylenetrinitramine (RDX), which is practically insoluble in chloroform. The cloudy appearance of the solution was initially attributed to saturation by the binder/additives and entrained air. Comparison of the spectrum in Fig. 1 with spectra of known C-4 components shows it to be a combined spectrum of RDX and DOS.

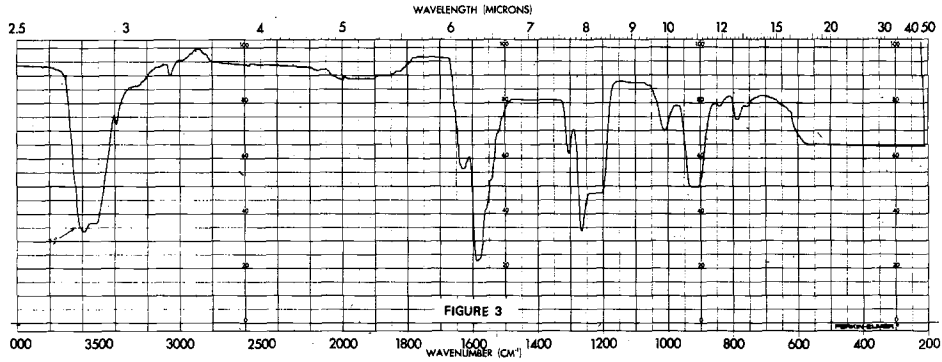

FIG. 3—*Acetone solution of RDX.*

The interference from RDX in the IR spectrum can be prevented in a rapid analysis by centrifuging the chloroform extract at 2500 rpm for 10 min in a Model HN-S centrifuge, International Equipment Co., Needham Heights, Mass. Any RDX will sediment, leaving a clear supernatant. Separation can also be achieved by allowing the solution to set 2 to 4 h. The examiner can then perform an analysis of the supernatant and will observe the spectrum shown in Fig. 2. The identification of the sediment as RDX may be accomplished by evaporating the residual chloroform and applying one or more of the following methods: IR spectroscopy of the sample in a potassium bromide (KBr) pellet, in an acetone solution (Fig. 3), or directly in a diamond cell; melting point determination; micro X-ray diffractometry; and polarized light microscopy.

Note: The explosive used in C-4 is RDX and is manufactured for C-4 as one part fine and three parts coarse. At least 75% of coarse RDX particles will be 74 μm and larger. Fine RDX particles will be 45 μm and less [*2*].

References

[*1*] Midkiff, C. and Washington, W., "Systematic Approach to the Detection of Explosive Residues: Part IV Military Explosives," *Journal of the Association of Official Analytical Chemists*, Vol. 59, Nov. 1976, pp. 1357-1374.

[*2*] U.S. Military Specification for RDX, Mil-R-398C, Aug. 1962 and Mil-R-398C (AR) Amendment 4, July 1977.

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