CASE REPORT

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An Explosive Drug Case

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ABSTRACT: As part of an investigation into a homicide, a white crystalline substance was found in a safe. The substance was submitted to the laboratory as a drug sample. Subsequent analysis proved the material to be triacetonetriperoxide (TATP), which is highly explosive. The results of analyses utilizing mass spectrometry, infrared (IR) and ultraviolet (UV) spectrophotometry, energy-dispersive X-ray spectrometry (EDXA), and gas chromatography are given, along with the circumstances leading to the discovery that the material was explosive.

KEYWORDS: criminalistics, triacetonetriperoxide (TATP), explosives, chemical analysis

Case History

During a search of a residence pursuant to a search warrant in a murder investigation, approximately 16 g of white crystalline powder was found in a locked safe. Since the suspect was known to have a connection to certain South American terrorist and drug smuggling groups, the substance was submitted to the laboratory as evidence in a drug case. The material was stored in a large stoppered glass test tube.

While a small amount of the material was being ground to be made into a potassium bromide pellet for infrared analysis, the sample exploded with the force of a small firecracker. At this point, it became obvious that this was no longer a routine drug case.

Upon contacting the submitting agency, it was learned that there were several more ounces of this material that had not been submitted to the laboratory and were, in fact, being stored under very unsafe conditions. Later conversations revealed that acetone and concentrated hydrochloric acid were also found along with the material submitted for analysis. Since these chemicals were commonly used for the production of cocaine hydrochloride, their presence was not alarming.

Analysis of the crystalline material is described below.

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Analysis and Results

Physical Properties

The substance in question was a white powdery material consisting of very small, fine crystals (melting point, 94.0 to 94.5°C). It was soluble in methanol and acetone and insoluble in water. A diagram of its structure is shown in Fig. 1.

Ultraviolet Spectrophotometry

Ultraviolet spectra of the methanol solution obtained on a Perkin-Elmer Model 200 spectrophotometer showed no significant absorption.

Gas Chromatography

The material was analyzed using a Hewlett-Packard 5890 gas chromatograph equipped with a capillary column operated in the split mode (40:1) and a flame ionization detector. A 10-m methyl silicone narrow-bore column using a helium carrier was utilized with temperature programing from 100 to 325°C at 25°C/min. The resulting peak gave a Kovat's retention index of 1100.

Gas Chromatography/Mass Spectrometry

A Hewlett-Packard 5970 mass selective detector interfaced with a Hewlett-Packard 5890 gas chromatograph was used to obtain the electron impact spectrum (Fig. 2) of the material. A Hewlett-Packard 5985 mass spectrometer interfaced with a Hewlett-Packard

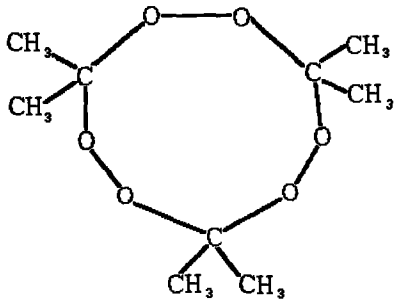

FIG. 1—*Structure of triacetonetriperoxide (TATP).*

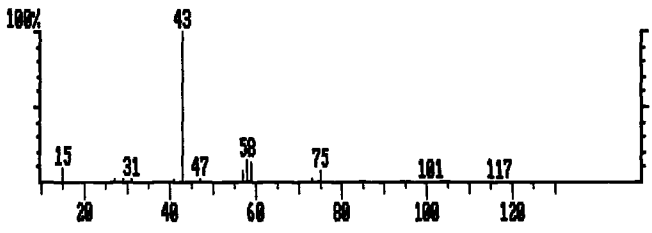

FIG. 2—*Electron impact mass spectrum of TATP.*

5840 gas chromatograph was used to obtain the chemical ionization spectrum (Fig. 3), using methane gas as the reagent gas. Chemical ionization indicated a molecular weight of 222.

Infrared Spectrophotometry

Infrared spectra of several crystals of the material, crushed on a silver chloride window, were obtained using a Bio-Rad FTS-40 Fourier transform infrared spectrophotometer with a UMA-300 infrared microscope equipped with a wide-band MCT detector. The absorption spectra in Figs. 4 and 5 were obtained.

Energy-Dispersive X-Ray Analysis

Energy-dispersive X-ray analysis was performed on the material using an AMRAY Model 1000 scanning electron microscope interfaced with an EDAX 9100 energy-dispersive X-ray system and an EDAX 9500 X-ray fluorescence spectrometer. No elements with an atomic number greater than 10 (neon) were detected.

Discussion

The material submitted was analyzed and the results were compared with published data and identified as triacetonetriperoxide (TATP, I) [*1,2*]. TATP is a heterocyclic nine-membered trimeric peroxide which is formed by reacting acetone with hydrogen peroxide in the presence of mineral acids [*3,4*].

TATP (250 cc) is a slightly less powerful explosive than trinitrotoluene (TNT) (285 cc) (power being measured by the Trauzl test) [*5*]. It can be used as a primary explosive but is most often used in detonators. It was first made in Germany in 1895 and has recently been identified in connection with cases related to terrorist activity. Its increased use by terrorist groups is possibly due to the fact that it cannot be detected by standard airport security systems [*1*].

As long as the material is dampened with an organic solvent it remains fairly stable. But, if it is allowed to air dry, it becomes a very shock, temperature, and friction sensitive high explosive which can even be detonated under water [*5*].

The major concern in this case is not the identification of this material, but rather the very fact that this material was submitted to the laboratory as a drug case. Better screening procedures are necessary to ensure that this situation does not occur again, perhaps the next time with bodily injury or loss of life. In this case, the connection between the suspect and known terrorist groups, in addition to the murder and conspiracy to commit murder charges pending against the suspect, should have given ample warning that this material might not be drugs. Communications between crime laboratories and law enforcement agencies must continue to improve, not only to ensure the best possible services for the contributing agencies, but also, as in this case, to ensure the safety of all concerned.

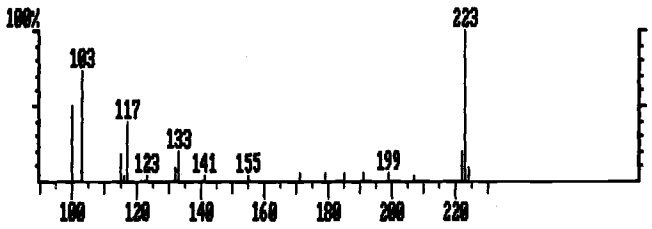

FIG. 3—*Chemical ionization mass spectrum of TATP.*

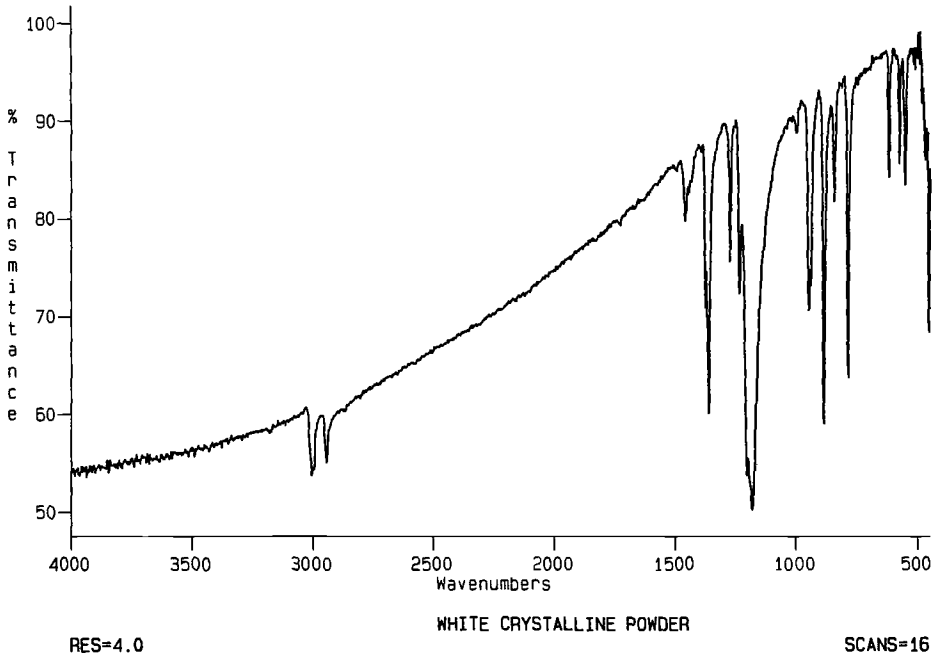

FIG. 4—*Fourier transform infrared spectrum of TATP 4000 to 500 cm*$^{-1}$.

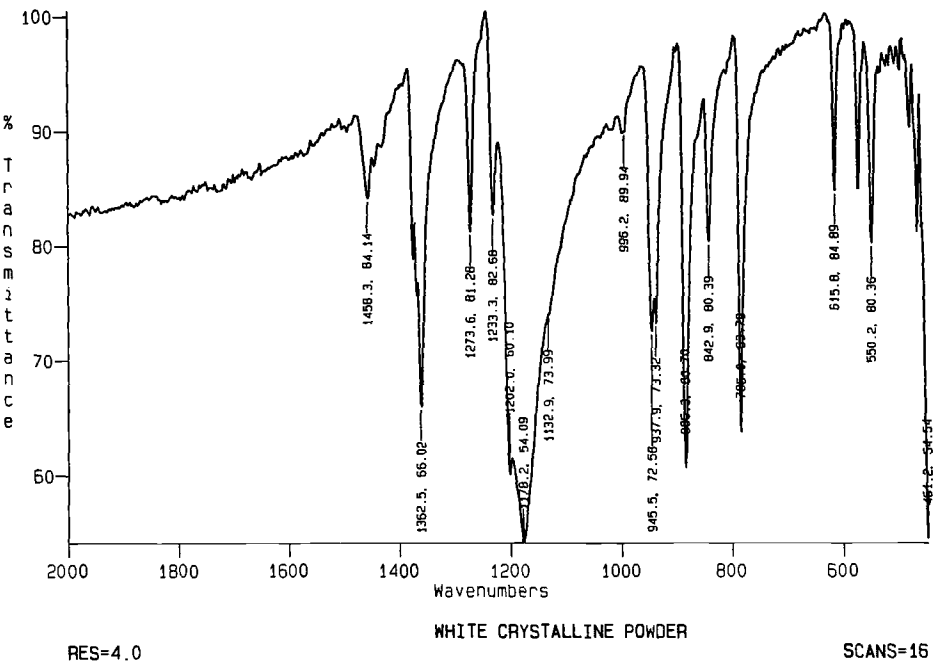

FIG. 5—*Fourier transform infrared spectrum of TATP 2000 to 500 cm*$^{-1}$.

Acknowledgments

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References

[1] Zitrin, S., Kraus, S., and Glattstein, B., "Identification of Two Rare Explosives," *Proceedings of the International Symposium on the Analysis and Detection of Explosives*, U.S. Government Printing Office, Washington, DC, 1984, pp. 858–860.

[2] Evans, H. K., Tullners, F. A. J., Sanchez, B. L., and Rasmussen, C. A., "An Unusual Explosive, Triacetonetriperoxide (TATP)," *Journal of Forensic Sciences*, Vol. 31, No. 3, July 1986, pp. 1119–1125.

[3] Anet, F. A. L. and Yavari, I., "The Chiral Stabilities of 'Trimeric Ketone Peroxides'," *Tetrahedron Letters*, No. 42, 1976, pp. 3787–3790.

[4] Milas, N. A. and Golubovic, A., "Studies in Organic Peroxides: XXVI. Organic Peroxides Derived from Acetone and Hydrogen Peroxide," *Journal of the American Chemical Society*, Vol. 81, 20 Dec. 1959, pp. 6461–6462.

[5] Federoff, B. T. and Scheffield, O. E., *Encyclopedia of Explosives and Related Items*, Vol. 1, Picatinny Arsenal, Dover, NJ, 1960, pp. A42–A45.

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