

CASE REPORT

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An Unusual Explosive Find

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ABSTRACT: In July 1992, ten bottles containing explosives were unearthed on a farm. The explosives were found to be a chlorate/dinitro-toluene mixture similar to a type used in World War I. The bottles were found to date from circa 1920. The explosive cache was probably in the ditch for more than 70 years.

KEYWORDS: criminalistics, explosives

In July 1992, during the course of some excavation for drainage purposes on a farm on the southern side of the border between the Republic of Ireland and Northern Ireland ten corked glass bottles were unearthed. The police were informed by the owner and the bottles were found to contain a yellow granular substance. The material was conveyed to the Dublin Forensic Science Laboratory for analysis. The mixture was found to be a mixture of potassium chlorate and dinitro-toluenes.

Potassium chlorate had been encountered in the laboratory in the past from explosive finds both on its own and mixed with sugar and nitrobenzene. These were cases of homemade explosives or incendiaries. Dinitro-toluenes had been previously analyzed in the laboratory as minor constituents of commercial plastic explosives. This was the first instance of a seizure of dinitro-toluene/chlorate explosive.

At first, the concern was whether this find was part of a recent bomb-making operation, which would have far-reaching consequences. However, it was clear early in the investigation that this was an old explosive dump because of the location of the find within the overgrown ditch and more significantly because the explosive was contained in corked glass bottles that appeared to be quite old.

Materials and Methods

5 grams of the granular yellow material was extracted with 100 mL diethyl ether. Initial examination of the ether extract by gas chromatography (electron capture detector) showed two peaks. These peaks were identified as 2,6-dinitro-toluene and 2,4-dinitro-toluene using

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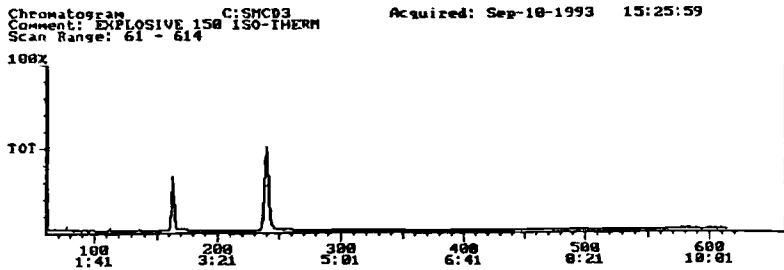


FIG. 1—GC-MS trace of ether extract. Perkin-Elmer 8420 GC linked to Perkin-Elmer. I.T.D. using a 6m NB 1701 column, isothermally at 150°C.

a Perkin-Elmer Ion Trap Detector linked to a Perkin-Elmer 8420 Gas Chromatograph (Figs. 1 and 2) by using a library search and by comparison with standards.

An infrared analysis of the residue remaining after evaporation of the ether showed all the peaks for dinitro-toluenes but also showed a peak at 1701 cm^{-1} consistent with a carbonyl group.

This carbonyl-containing material was isolated by preparative thin layer chromatography using 40 to 60 petroleum ether:1,2-dichloroethane (4:1) as the solvent. This material was identified as a fatty acid by I.R.

The ether insoluble material was extracted with water (100 mL) and identified as potassium chlorate by I.R. spectroscopy using a Nicolet DXB, F.T.-I.R. and X-ray fluorescence using a link AN 10/55S X.R.F and by chlorate spot tests [7]. A comparison between the explosive composition of the material found in the bottles and other chlorate explosives is given in Table 1. In the explosives from this find no mononitro-naphthalene or castor oil was present.

Discussion

Chlorate-based explosives are especially sensitive to shock and friction and their manufacture in the U.S. was abandoned after a long series of plant and field accidents [2]. The

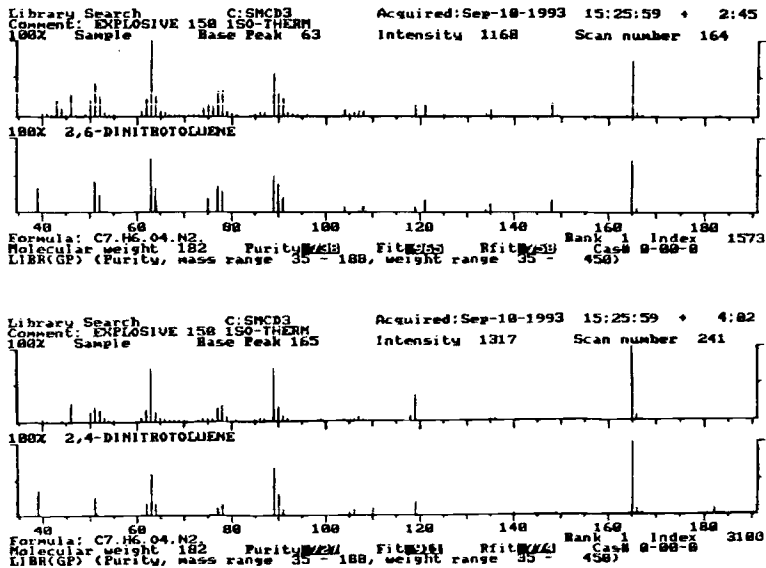


FIG. 2—GC-MS library search of peaks eluting at 2.45 minutes and 4.02 minutes.

TABLE 1—*Composition of some chlorate explosives.*

Constituent %	Cheddite explosives [3]			Case sample
	A	B	C	
Dinitrotoluene	2	15	16	13 ^{a,b}
Mononitronaphthalene	13	1
Castor oil	5	5	5	...
Potassium chlorate	80	79	...	87
Sodium chlorate	79	...

^aRatio of 2,4-DNT : 2,6-DNT = 60:40.

^bIncluding some fatty oil.

composition of the material seized in this case (Table 1) conforms generally to a class of explosives called cheddites [3,4]. These were a class of explosive originally manufactured in Chedde in France prior to World War 1. It was discovered that the dangerous sensitiveness of chlorate mixtures could be reduced by coating the chlorate with an oily material such as castor oil, linseed oil or rosin oil [4]. This gives rise to the fatty acid material isolated.

The nitration of toluene to dinitro-toluene gives an oil that is approximately 75% of the 2,4-isomer [2] and thus the ratio of the 2,4-isomer to the 2,6-isomer (60:40, Table 1) is different from that expected.



FIG. 3—*Photograph of some of the bottles unearthed.*

In an effort to pinpoint the exact age of the explosive the glass bottles were examined in more detail. It is reasonable to assume that the explosives were packed into bottles that were in everyday use at the time of packing. Therefore dating of the bottles would help date the explosives.

The bottles (Fig. 3) included green glass, brown glass and clear glass. The clear glass had a green tint and all the bottles had vertical seams that show them to be machine made and therefore from this century. Some of the bottles had distinguishing marks and enquiries² have shown the bottles to date from circa 1920.

The age of the bottles and the composition of the explosives show them to be from the early part of this century (1910 to 1920) making it reasonable to assume that the cache was hidden for use in the Irish War of Independence 1919 to 1921.

The previous owner of the farm on which the find was made died in 1950 and was active in that war. The explosives however, remained hidden in the ditch for probably more than 70 years.

Acknowledgments

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References

- [1] Feigl, F. and Anger, V., *Spot Tests in Inorganic Analysis*, Elsevier, 1972, Sixth Edition, p. 182.
- [2] Kirk-Othmer, *Encyclopedia of Chemical Technology*, Wiley-Interscience, Second Edition, Vol. 8.
- [3] Colver, W. S., *High Explosives, A Practical Treatise*, Crosby Lockwood, London, 1918, p. 168.
- [4] Marshall, A., *Explosives*, J and A Churchill, London, 1917, Second Edition, Vol. 1, p. 380.

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