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Advances in explosives analysis—part II: photon and neutron methods

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NG

Nitroglycerine; nitro; glyceryl trinitrate; RNG; trinitroglycerine

NTO

Nitrotriazalone

PETN

Pentaerythritol tetranitrate; 2,2-bis[(nitroxy)methyl]-1,3-propanediol; dinitrate

RDX

Cyclonite; hexogen; hexahydro-1,3,5-trinitro-1,3,5-triazine

Semtex

Composition of PETN (or RDX and PETN) with heavy oils and rubbers

TATP

Triacetone triperoxide

Tetryl

Methyl-2,4,6-trinitrophenylnitramine

TNT

2,4,6-Trinitrotoluene; 2-methyl-1,3,5-trinitrobenzene

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Abstract

The number and capability of explosives detection and analysis methods have increased dramatically since publication of the Analytical and Bioanalytical Chemistry special issue devoted to Explosives Analysis [Moore DS, Goodpaster JV, Anal Bioanal Chem 395:245–246, 2009]. Here we review and critically evaluate the latest (the past five years) important advances in explosives detection, with details of the improvements over previous methods, and suggest possible avenues towards further advances in, e.g., stand-off distance, detection limit, selectivity, and penetration through camouflage or packaging. The review consists of two parts. Part I discussed methods based on animals, chemicals (including colorimetry, molecularly imprinted polymers, electrochemistry, and immunochemistry), ions (both ion-mobility spectrometry and mass spectrometry), and mechanical devices. This part, Part II, will review methods based on photons, from very energetic photons including X-rays and gamma rays down to the terahertz range, and neutrons.

Keywords

Explosives detection Trace analysis Explosives Improvised explosives Instrumentation Reviews

Explosives glossary

AN

Ammonium nitrate

ANTA

3-Amino-5-nitro-1,2,4-triazole

DNB

Dinitrobenzene (isomers 1,3-DNB and 1,4-DNB)

DNT

Dinitrotoluene (isomers 2,4-DNT and 2,6-DNT)

FOX-7

1,1-Diamino-2,2-dinitroethene (DADNE)

HME

Homemade explosive

HMTD

Hexamethylene triperoxide diamine

HMX

Octagen; octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine

IED

Improvised explosive device

Picric acid

2,4,6-Trinitrophenol

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