# The Science Of Explosives

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Explosives and Chemical Weapons Identification
Shock Wave Science and Technology Reference Library, Vol. 5

Vapour and Trace Detection of Explosives for Anti-Terrorism Purposes
The Science of Industrial Explosives



## BERRY STRICKLAND

John Wiley & Sons
This is a broad-based text on the fundamentals of explosive behavior and the application of explosives in civil engineering, industrial processes, aerospace applications, and military uses.
*Oops! It's Dynamite!*
Springer
The Science of ExplosivesThe Science of ExplosivesThe Science of High ExplosivesThe Science of Industrial ExplosivesBoom!
*Explosives and Chemical Weapons Identification*
Courier Corporation
Detection and quantification of trace chemicals is a major thrust of analytical chemistry. In recent years much effort has been spent developing detection systems for priority pollutants. Less mature are the detections of substances of interest to law enforcement and security personnel:in particular explosives. This volume will discuss the detection of these, not only setting out the theoretical fundamentals, but also emphasizing the remarkable developments in the last decade.
Terrorist events—airplanes blown out of the sky (PanAm 103 over Lockerbie) and

attacks on U.S. and European cities (Trade Center in New York and the Murrah Federal Building in Oklahoma City, railways in London and Madrid)--emphasize the danger of concealed explosives. However, since most explosives release little vapor, it was not possible to detect them by technology used on most organic substances. After PanAm 103 was downed over Scotland, the U.S. Congress requested automatic explosive detection equipment be placed in airports. This volume outlines the history of explosive detection research, the developments along the way, present day technologies, and what we think the future holds. Written by experts in the field who set out both the scientific issues and the practical context with authority Discusses and describes the threat Describes the theoretical background and practical applications of both trace and bulk explosives detection

*Explosives & Arson Investigation* CRC Press

The Analysis of Explosives surveys the principles of the various analytical methods, describes how these methods are used for the analysis of explosives, and reviews the major analytical work carried out in this field. Organized into 15 chapters, this book begins with the classification of explosives. Subsequent chapters discuss the different methods for the analysis of explosives. The detection and identification of explosive residues and hidden

explosives are also explained. This monograph will be useful as a reference book for chemists in analytical and forensic laboratories, as well as a textbook for graduate students in analytical chemistry and forensic sciences.
*The Science of High Explosives* Royal Society of Chemistry
I grew up during the times leading up to and during the Second World War. We were concerned with preparation for air raids, damage control and rescue. The science subjects were slanted in this direction also. I may have had a special inclination toward this field. Various military subjects, compulsory at college, enhanced my interest. Then after I got my engineering degree my employment at Nitrokmia RT., the explosives manufacturer, and under the leadership of Dr. Lszl Demny launched my professional career. After the war, as a chemical engineer I was involved with the most explosive chemicals as industrial intermediates, like acetylene and ethylene oxide. The processes to make those involved oxidation, where explosive limits of the raw materials and their intermediates were a significant consideration. In turn, this lead to the study of thermal runaways and ignition processes.
**The Chemistry of Explosives** Elsevier
This work marks a stage in the evolution of a scientific and technical field which has been developed by the Commissariat a l'Energie

Atomique (CEA) over several decades. Many members of the staff of the CEA have won re nown in this field, and their work has brought it to the high degree of excel lence for which it is internationally recognized today. These scientists had to consider every aspect of the field, as it concerned: modeling, which has recourse to fluid thermodynamics, molecular phys ics, and chemistry; numerical evaluation, which relies on mathematical analysis and data processing; and experiments in the firing area, which require specific stress generators and instrumentation. Whilst this book is a testament to the activity and success of staff of the CEA, it also reviews a number ofthe advances made in the discipline. How ever, it is not intended to be an exhaustive account of those advances; it is assumed that the reader can, if desired, consult the standard monographs, and more recent, more specialized works (notably W.C. Davis and W. Fickett, and C.L. Mader). The history of the discipline is interesting in itself, and also as an illustra tion of the causes which lead to progress in a coherent body of scientific work. I should like to make some comments on this progress, of which there is a fascinating summary in the introduction, and which will figure largely throughout the work.

Detonation Elsevier

The problem of reliably detecting explosives, whether in buried landmines or hidden in cars, aircraft cargo,

baggage, or carried by suicide bombers, has not yet been solved. Explosive device detection technology can make a major contribution to collective, family and individual security. This book reviews the state of the art in a wide range of different technologies and considers whether there are alternative methods or technologies. It includes information from experts about methods and field experience. The consensus is that current sensor technologies are inadequate for most mine action tasks and anti-terrorist activities (consider plastic mines) and no single sensor system will be able to meet all needs. Scientists must forge strong links with end users and should visit real minefields to acquire a clear understanding of the problems.

**Chemistry of High-Energy Materials**

Diversion Books

This book represents a collection of lectures presented at the NATO Advanced study Institute(ASI) on "Chemistry & Physics of the Molecular Processes in Energetic Materials", held at Hotel Torre Normanna, Altavilla Milicia, Sicily, Italy, September 3 to 15, 1989. The institute was attended by seventy participants including twenty lecturers, drawn from thirteen countries. The purpose of the institute was to review the major ad vances made in recent years in the theoretical and experi mental aspects of explosives and propellants. In accordance with the format of the

NATO ASI, it was arranged to have a relatively small number of speakers to present in depth, re view type lectures emphasizing the basic research aspects of the subject, over a two week period. Most of the speakers gave two lectures, each in excess of one hour with addition al time for discussions. The scope of the meeting was limit ed to molecular and spectroscopic studies since the hydro dynamic aspects of detonation and various performance crite ria of energetic materials are often covered adequately in other international meetings. An attempt was made to have a coherent presentation of various theoretical, computational and spectroscopic approaches to help a better understanding of energetic materials from a molecular point of view. The progress already made in these areas is such that structure property (e. g. *Explosive Effects and Applications* Springer Science & Business Media Chemicalsare a part of daily life and can be found all around us. Many common chemicals when mixed improperly  whether intentionally or not  can pose serious consequences to those who come in contact with them. Written by an author who is an experiencedhazmat-qualifiedfirst responder,forensicspecialist, and educator, Explosives and Chemical Weapons Identificationprovides the means to quickly identify the type of explosive or chemical weapon at hand

upon arriving at the scene. A thorough and accessible reference, this book contains the identification capabilities for 468 different formulations for explosives and chemical weapons. It presents detailed descriptions for each of these formulations by breaking down their materials into five concise categories: common name, synonym, class, ingredients, and use. The materials are also indexed by common name, class, and ingredient. A handy reference packed with critical information and over 350 illustrations and photographs to aid in visual identification, Explosives and Chemical Weapons Identificationis an essential resource that everyfirst responder and forensic professional must have within reach everytime.

*Bomb Scene Investigation*

Springer Science & Business Media

This unique book is a store of less well-known explosion and detonation phenomena, including also data and experiences related to safety risks. It highlights the shortcomings of the current engineering codes based on a classical plane wave model of the phenomenon, and why these tools must fail. For the first time all the explosion phenomena are described in terms of proper assemblages of hot spots, which emit pressure waves and associated near field terms in flow. Not all of the approaches are new. Some even date back to the 19th century or earlier.. What is new is

the application of these approaches to explosion phenomena. In order to make these tools easily available to the current detonation physicist, basic acoustics is therefore also addressed. Whereas the current plane wave, homogeneous flow detonation physics is an excellent engineering tool for numerical predictions under given conditions, the multi-hot-spot-model is an additional tool for analyzing phenomena that cannot be explained by classical calculations. The real benefit comes from being able to understand, without any artificial assumptions, the whole phenomenology of detonations and explosions. By specifying pressure generating mechanisms, one is able to see that the current treatment of the detonics of energetic materials is only a very special - but powerful - case of explosion events and hazards. It becomes clear that physical explosions must be taken into account in any safety considerations. In these terms it is easy to understand why even liquid carbon dioxide and inert silo materials can explode. A unique collection of unexpected events, which might surprise even specialists, has resulted from the evaluation of the model. Therefore this book is valuable for each explosion and safety scientist for the understanding and forecasting of unwanted events. The text mainly addresses the next generation of explosion and detonation scientists, with the goal of promoting

the science of detonation on a new physical basis. For this reason gaps in current knowledge are also addressed. The science of explosions is not fully mature, but is still in its beginning - and the tools necessary for furthering the understanding of these phenomena have been with us for centuries.

*The Chemistry of Powder and Explosives* Springer Nature

Field takes readers on a decades-long journey through the history of things that go boom. From the early days of black powder to today's modern plastic explosives, he details now just the who, when, and why, but also the how. He explains how explosives work on a molecular scale, and gives readers a basic understanding of the chemistry that makes them possible.

*The Science of Explosives* Springer Science & Business Media

"Revised and expanded to reflect new developments in the field, this book outlines the basic principles required to understand the chemical processes of explosives. The Chemistry of Explosives provides an overview of the history of explosives, taking the reader to future developments. The text on the classification of explosive materials contains much data on the physical parameters of primary and secondary explosives. The explosive processes of deflagration and detonation, including the theory of 'hotspots' for the detonation process, are introduced and many examples are

provided in the detailed description on the thermochemistry of explosives. New material includes coverage of the latest explosive compositions, such as high temperature explosives, nitrocubanes, energetic polymers, plasticizers and insensitive munitions (IM). This concise, readable book is ideal for 'A' level students and new graduates with no previous knowledge of explosive materials. With detailed information on a vast range of explosives in tabular form and an extensive bibliography, this book will also be useful to anyone needing succinct information on the subject."

*Introduction to the Technology of Explosives*

The Science of ExplosivesThe Science of ExplosivesThe Science of High ExplosivesThe Science of Industrial ExplosivesBoom!Field takes readers on a decades-long journey through the history of things that go boom. From the early days of black powder to today's modern plastic explosives, he details now just the who, when, and why, but also the how. He explains how explosives work on a molecular scale, and gives readers a basic understanding of the chemistry that makes them possible.The Science of High ExplosivesShock Wave Science and Technology Reference Library, Vol. 5

The FBI's Chief Explosives Scientist takes readers to blast zones, forensics laboratories, field tests, and more in pursuit of modern history's most

notorious bombers. Join his dedicated team as they work disassembling, reassembling, detonating, and studying explosives to identify (and hopefully incarcerate) criminals bent on mass destruction, and to prevent others from wreaking further havoc. Oklahoma City. The Boston Marathon. Syria. The USS Cole. The Collar Bomber. There is no shortage of tragic bombings in today's world, where terrorism--waged by hate groups and radical individuals alike--is among the defining fears of a generation. But what if history and forensic science reveal an even more sinister truth: that bombs have been a tool of terror for more than a century, since explosives emerged? Bomb Scene Investigation threads the history of bombings with a twenty-first century understanding of the materials and mechanics of dangerous explosives through the eyes of America's chief expert--the first working FBI official granted permission to share bomb investigation stories while still at the agency. Follow along as Dr. Kirk Yeager leads his impressive forensic team into crime scenes of mass destruction--literally hot on the heels of those who have tried to blow our sense of security to bits. From Oklahoma City to the Boston Marathon and more, Dr. Yeager's team has been at the front lines of today's most important bomb scene investigations--meticulously putting the charred pieces back together to identify

culprits around the world. Looking back on history and his career, Dr. Yeager shows that evil is not a new permutation in human behavior, and that science--even the science of explosives--is a distinctly human endeavor, for better or for worse. Bomb Scene Investigation unveils the fascinating and often frightening world of bomb detectives through the lens and mind of the FBI scientist, often darkly humorous, known as "Dr. Bomb."

*What a Blast!* CRC Press This book provides chemists with technical insight on pyrotechnics and explosives. It emphasizes basic chemical principles and practical, hands-on knowledge in the preparation of energetic materials. It examines the interactions between and adaptations of pyrotechnics to changing technology in areas such as obscuration science and low-signature flame emission. The updated third edition discusses chemical and pyrotechnic principles, components of high-energy materials, elements of ignition, propagation, and sensitivity. It offers heat compositions, including ignition mixes, delays, thermites, and propellants and investigates the production of smoke and sound as well as light and color.

*My Explosive Life* Springer Boom! Dynamite can blast away mountainsides and bring down buildings. This powerful explosive was discovered over 150 years ago, but it wasn't always safe to use. That's because dynamite

contains nitroglycerin, a very dangerous explosive. In the late 1860s, Swedish chemist Alfred Nobel accidentally invented dynamite while he was working on a way to make nitroglycerin safer to handle. This book takes an in-depth look at the science behind dynamite, as well as its role in the past, present, and future of demolition. Readers will have a blast learning about this explosive discovery.

**Chemistry of Pyrotechnics** Gareth Stevens Publishing LLLP

Two thousand years ago, Chinese scientists were looking for a medicine that would make them live forever. Instead, they blew up their lab and discovered gunpowder. Alfred Nobel blew up his laboratory twice before he discovered the formula for dynamite. Learn about the Apollo 13 and Challenger explosions and the strange space explosions caused by top secret Starfish Prime. These stories may sound twisted, but they're all true tales from science! Ages 9-12

*Boom!* Legare Street Press

An uncanny calm settles on the scene. The blaze is out. A soggy, sooty mess remains. Most of us wouldn't have a clue where to begin, yet fire and explosion investigators know precisely where and how to dig in. Other books in this series show that documents, fingerprints, a stray hair, fibers, bullets, tool marks, blood spatter, SNA, cigarette butts, insects, or even a simple candy wrapper can provide clinching proof in

many legal cases—but fire and bombs destroy these bits of evidence. What clues can forensic scientists possibly glean from rubble and ash? Using real-life stories as examples, Explosives & Arson Investigation explores the world of fire—and bomb-scene investigation. From first-on-the-scene priorities to collecting and documenting evidence to lab analysis and its procedures, then finally assessing motive, this book reveals basic fire characteristics, what investigators look for, how they process what they find, the meaning of specific clues, and common motives—all while highlighting various forensic careers.

*Ammonium Nitrate Explosives for Civil Applications* Xlibris Corporation

Demystifying Explosives: Concepts in High Energy Materials explains the basic concepts of and the science behind the entire spectrum of high energy materials (HEMs) and gives a broad perspective about all types of HEMs and their interrelationships. Demystifying Explosives covers topics ranging from explosives, deflagration, detonation, and pyrotechnics to safety and security aspects of HEMS, looking at their aspects, particularly their inter-relatedness with respect to properties and performance. The book explains concepts related to the molecular structure of HEMs, their properties, performance parameters, detonation and shock waves including explosives and

propellants. The theory-based title also deals with important (safety and security) and interesting (constructive applications) aspects connected with HEMs and is of fundamental use to students in their introduction to these materials and applications. Explains the concept of high energy materials in simple language and down-to-earth examples Worked examples and problems are given wherever required Demystifies the concept of explosives Limited use of big and complex equations Questions and Suggested Reading are given at the end of each chapter

Twisted True Tales From Science Springer Science & Business Media

This book describes the research of Bowden, Yoffe and their collaborators on explosive initiation. What Bowden and Yoffe showed was that explosives are ignited almost invariably by thermal processes and though other processes have been identified their work still holds.

**Forensic and Environmental Detection of Explosives**

Walter de Gruyter GmbH & Co KG

This advanced and specialized introduction to the hydrodynamics of detonation offers a theoretical and observational overview. It explores the "simple theory" and experimental tests of the theory; flow in a reactive medium; steady detonation; the nonsteady solution; and the structure of the detonation front. Many simple cases are worked out for illustration. 1979

edition.

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