Title: DETONATION AND COMBUSTION OF EXPLOSIVES: A SELECTED BIBLIOGRAPHY

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Submitted to: 11th International Detonation Symposium
Snowmass Conference Center
Snowmass, Colorado
August 30-September 4, 1998

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DETONATION AND COMBUSTION OF EXPLOSIVES:
A SELECTED BIBLIOGRAPHY

Compiled by Brigitta Dobratz

Los Alamos, New Mexico

August 1998
ABSTRACT

This bibliography consists of citations pertinent to the subjects of combustion and detonation of energetic materials, especially, but not exclusively, of secondary solid high explosives. These references were selected from abstracting sources, conference proceedings, reviews, and also individual works. The entries are arranged alphabetically by first author and numbered sequentially. A keyword index is appended.

INTRODUCTION

The “science of explosives” grew over time as the number of energetic materials discovered and used proliferated, and chemical and physical properties, performance, applications, related properties, and theoretical aspects were studied. The study of combustion and detonation is one such discipline.

Reports of the first explosive - a mixture of saltpeter, sulfur, and charcoal - called gunpowder or black powder, was described in Chinese writing before 1000 AD. Various powder mixtures were used in bombs, rockets, pyrotechnics, and related items, which deflagrate but do not detonate. Such explosives are called “low” explosives. The next major development occurred when the DuPont de Nemours family built a plant in Wilmington, Delaware in 1802 to mass-produce gunpowder and initiators. They compiled the “Blaster’s Handbook” as a guide.

The 19th century saw rapid growth in the field of explosive science. Many detonating explosives were synthesized. These explosives are designated “high” explosives, and are divided into two classes: primary or initiating explosives, mostly inorganic metal azides and fulminates; and secondary, which are mostly CHNO compounds and mixtures. Nobel obtained a Swedish patent in 1863 for a nitroglycerin (NG) percussion detonator. After several fatal accidents, he incorporated NG in an absorbent inert substance named kieselguhr and patented it as dynamite in 1866. In 1875 Nobel introduced blasting gelatin, also called gelatin dynamite, which is nitrocellulose dissolved in NG. Many chemical compounds were synthesized in Europe and the USA that were recognized as explosives. Some compounds frequently used in secondary explosives are listed below.

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<td>ammonium perchlorate (AP)</td>
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<tr>
<td>hexogen (RDX)</td>
<td>1899</td>
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<tr>
<td>nitroglycerin (NG)</td>
<td>1846</td>
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<tr>
<td>nitroguanidine (NQ)</td>
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<td>trinitrotoluene (TNT)</td>
<td>1863</td>
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</tbody>
</table>

Many of these explosives and mixtures were used in WWI. Then came WWII with synthesis of HMX, the development of atomic bombs and propellants for weapons, rockets, and space flight. Theoretical developments, modeling, and data manipulation were aided by developments in computer hardware and software.

Because of this proliferation in development and applications of energetic materials with concomitant “explosion” of the literature, this bibliography is limited to references on combustion and detonation of high explosives (HE). Also, no attempt has been made to cover this ever-growing body of literature exhaustively. However, references on general works and milestone developments have been included in this compilation. Three journals have ceased publication: Explosifs 1948-1982 (Belgian), Explosivstoffe 1952-1973 (German); this has been resurrected as Propellants, Explosives, and Pyrotechnics (International), and the Zeitschrift fur das gesamte Schiess- und Sprengstoffwesen 1906-1944 (German). The users of this compilation may want to use additional sources of information. For example, a detailed index (LA-UR-2237) exists for the papers presented at the Detonation Symposia.
The citations, selected from abstracting sources, conference proceedings, reviews, and individual books, are arranged alphabetically by first author and numbered sequentially. A keyword index has been compiled at the end of the listing.

ACKNOWLEDGMENTS

The author would like to thank J. E. Kennedy for suggesting this project, providing many useful suggestions as well as several source works, and taking the time to proofread the entire document. Thanks go also to W. E. Deal and J. Vorthman for many helpful suggestions and to J. H. Carter for providing the computerized literature searches.
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