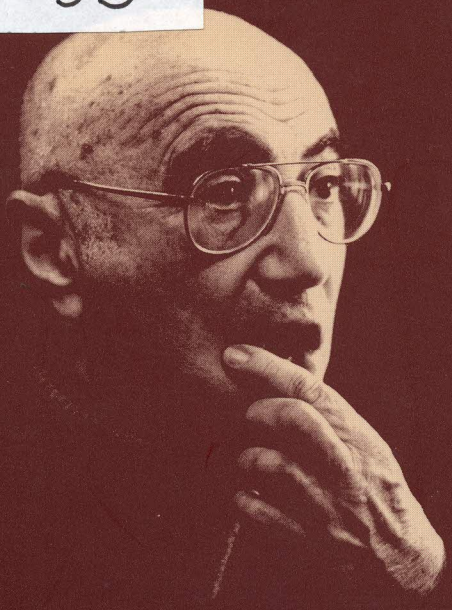
Zel'dovich Memorial



PROGRESS IN COMBUSTION AND DETONATION

Edited by

A. Borisov
S. Frolov
A. Kuhl

Progress in Combustion and Detonation

Достижения в науке о горении и детонации

Edited by

A. A. Borisov
S.M. Frolov
A. L. Kuhl

TORUS PRESS

Anatolii A. Borisov
N. N. Semenov Institute of Chemical Physics
Russian Academy of Sciences
4 Kosigin Str., Moscow 119991, Russian Federation

Sergei M. Frolov
N. N. Semenov Institute of Chemical Physics
Russian Academy of Sciences
4 Kosigin Str., Moscow 119991, Russian Federation

Allen L. Kuhl
Lawrence Livermore National Laboratory
Livermore, CA 94550, USA

ББК 24.54
Г 67
УДК 662.61

Progress in Combustion and Detonation / [Edited by A. A. Borisov, S. M. Frolov, A. L. Kuhl]. — Moscow: TORUS PRESS Ltd., 2004. — 432 p. Tabl. 2, ill. 39.

ISBN 5-94588-027-2

This book is a collection of more than 200 revised, edited, and formatted extended abstracts of papers submitted to the International Conference on Combustion and Detonation, dedicated to the memory of Academician Ya. B. Zel'dovich (Zel'dovich Memorial), held in Moscow, Russia, August 30 – September 3, 2004. The contents of the book include recent worldwide accomplishments in fundamental and applied studies on combustion and detonations in gases, solids, sprays, and hybrid reactive media, as well as various hydrodynamic phenomena at extreme states of the matter. The volume is addressed to practicing engineers, research scientists working in the field of combustion and explosion, experts in fire protection and safety, and can serve as a reference book for graduate studies in combustion science and technology.

ББК 24.54

ISBN 5-94588-027-2

Managing Editor T. Torzhkova
Technical Editor L. Kokushkina
Art Editor M. Sedakova
Cover Design A. Sevryugin

Printed in Russian Federation

SYNCHROTRON RADIATION STUDY OF INITIATION OF POWDER EXPLOSIVE

P. I. Zubkov*, G. N. Kulipanov†, L. A. Luk'yanchikov*, L. A. Merzhievsky*, E. R. Pruuel*, K. A. Ten*, V. M. Titov*, B. P. Tolochko‡, M. G. Fedotov†, M. R. Sharafutdinov†, M. A. Sheromov†, I. L. Jogin‡, V. V. Julanov†, L. I. Shehtman†, and V. M. Aul'chenko†

*M. A. Lavrentyev Institute of Hydrodynamics
Siberian Branch of the Russian Academy of Sciences
Novosibirsk, Russia

†Budker Institute of Nuclear Physics
Siberian Branch of the Russian Academy of Sciences
Novosibirsk, Russia

‡Institute of Solid Chemistry and Mechanochemistry
Siberian Branch of the Russian Academy of Sciences
Novosibirsk, Russia

There are many investigations that concern processes of initiation of explosives, but the problem has not been completely solved and remains an important task for physics of detonation processes. The results of the use of synchrotron radiation for studying transient processes attending initiation of porous explosive charges are presented in the paper. The use of synchrotron radiation made it possible to obtain information about evolution of density at dynamic initiation of powdered PETN by electrical explosion of a conductor. Variation of the charge diameter and casing has allowed the present authors to study both the processes leading to initiation of normal detonation and transient processes treated as nonideal detonation regimes. The density dependences on time and distance to the site of detonation onset are recovered from measurements.

Nonmonotonic changes of the density maximum in a propagating compression wave are observed when normal detonation is initiated.

The maximum density is attained about 10 mm away from the initiation point. Then the pressure in the wave increases while the density drops to the stationary detonation value.

Compression of the explosive material which gives rise to initiation of detonation by a shock wave of the minimal amplitude has not been attained in nonideal detonation waves spreading at an approximately constant velocity through few tens of the charge diameter. Transition to normal detonation is possible by increasing the charge diameter. From the result obtained, it can be infered that there are initiation processes which do not involve formation of hot spots behind the shock front.

Acknowledgments

The work was supported by the Russian Foundation for Basic Research (Grants 01-02-18031, NSh-2073.2003.1) and grant of the Siberian Branch of the Russian Academy of Sciences No. 120.

Научное издание

Progress in Combustion and Detonation /
Edited by A. A. Borisov, S. M. Frolov, and A. L. Kuhl

Достижения в науке о горении и детонации /
Под ред. А. А. Борисова, С. М. Фролова, А. Л. Кула

Титульный редактор: Т. Торжкова
Технический редактор: Л. Кокушкина
Художественный редактор: М. Седакова
Дизайн обложки: А. Севрюгин

Лицензия ИД № 04600 от 24.04.01

Сдано в набор 04.06.04. Подписано в печать 04.08.04
Формат 60 × 90/16. Бумага офсетная. Печать офсетная
Усл.-печ. л. 27. Уч.-изд. л. 22. Тираж 500 экз.

Заказ № 117.

Издательство «ТОРУС ПРЕСС»
115201, г. Москва-201, а/я 3
torus@torus-press.ru
http://www.torus-press.ru

Отпечатано в ООО «Бэйсик»
с готовых диапозитивов
113054, г. Москва, ул. Бахрушина, д. 21-23, стр. 5.