

1st Conference on the Chemistry and Physics of Detonation and 2nd ONR Symposium on Detonation

Washington, DC, USA
11-12 January 1951

White Oak, Maryland, USA
9-10 February 1955

ISBN: 979-8-3313-2618-0

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (1951 and 1955) by Johns Hopkins University WSE Energetics Research Group
All rights reserved.

Printed with permission by Curran Associates, Inc. (2026)

For permission requests, please contact Johns Hopkins University WSE Energetics Research Group
at the address below.

Johns Hopkins University WSE Energetics Research Group
10630 Little Patuxent Pkwy
Suite 202
Columbia MD 21044-3286

Phone: (410) 992-7300
Fax: (410) 730-4969

<https://www.erg.jhu.edu>

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

CONFERENCE ON THE CHEMISTRY AND PHYSICS OF DETONATION

CONTENTS

WELCOMING ADDRESS	3
Rear Admiral T. A. Solberg, USN Chief of Naval Research	
SESSION I REVIEW OF RECENT STUDIES	
RECENT STUDIES IN BUORD	7
Stephen Brunauer Bureau of Ordnance	
RECENT WORK ON DETONATION AT ABERDEEN	9
Jane Dewey Aberdeen Proving Ground	
STUDIES ON DETONATION PHENOMENA	12
F. C. Gibson and C. M. Mason Bureau of Mines, Pittsburgh	
RECENT WORK AT NOL	22
Donna Price Naval Ordnance Laboratory	
RECENT STUDIES AT THE NAVAL ORDNANCE TEST STATION	31
John S. Rinehart NOTS, Inyokern	
SOME RECENT STUDIES IN CANADA	39
G. R. Walker Canadian Armament Research and Development Establishment	
SESSION II CHEMICAL ASPECTS OF DETONATION	
CHEMICAL ASPECTS OF DETONATION	43
Bernard Lewis Bureau of Mines	
NONSTATIONARY DETONATION WAVES IN GASES	45
George B. Kistiakowsky Harvard University	
DURATION OF THE REACTION IN A DETONATING EXPLOSIVE	52
S. J. Jacobs Naval Ordnance Laboratory	
EXPERIMENTS ON THE TRANSITION FROM DEFLAGRATION TO DETONATION	57
J. Roth Hercules Powder Company	

**SESSION III
PHYSICAL ASPECTS OF DETONATION**

PHYSICAL ASPECTS OF DETONATION	71
John G. Kirkwood California Institute of Technology	
THE EQUATION OF STATE FOR DETONATION GASES	72
Stuart R. Brinkley, Jr. Bureau of Mines, Pittsburgh	
CONVERGENT SHOCK WAVES	79
Arthur Kantrowitz Cornell University	
SHOCK WAVES IN SOLIDS	88
J. E. Ablard Naval Ordnance Laboratory	
INTERACTIONS OF DETONATION WAVES WITH MATERIAL BOUNDARIES	93
R. B. Parlin and H. Eyring University of Utah	

**SESSION IV
PROBLEMS AND FUTURE DEVELOPMENTS**

PROBLEMS AND FUTURE DEVELOPMENTS	105
George B. Kistiakowsky Harvard University	
THEORETICAL DEVELOPMENTS IN DETONATION	107
John G. Kirkwood California Institute of Technology	

SECOND ONR SYMPOSIUM ON DETONATION

CONTENTS

CHARGE PREPARATION FOR PRECISE DETONATION VELOCITY STUDIES . . .	119
Edward James, Jr. Los Alamos Scientific Laboratory	
TECHNIQUE FOR THE MEASUREMENT OF DETONATION VELOCITY	136
A. W. Campbell, M. E. Malin, T. J. Boyd, Jr., and J. A. Hull Los Alamos Scientific Laboratory	
A MICROWAVE TECHNIQUE FOR MEASURING DETONATION VELOCITY . . .	151
T. J. Boyd, Jr., and P. Fagan Los Alamos Scientific Laboratory	
MEASUREMENT OF DETONATION TEMPERATURES	157
F.C. Gibson, M. Bowser, C. R. Summers, F. Scott, J. C. Cooper, and C. M. Mason U. S. Bureau of Mines	
A NEW CINE MICROSCOPE AND ITS APPLICATION TO DETONATION PHENOMENA	168
J. S. Courtney-Pratt University of Cambridge	
THE MEASUREMENT OF DENSITY CHANGES IN GASEOUS DETONATIONS . . .	187
G. B. Kistiakowsky and P. H. Kydd Harvard University	
THE ATTAINMENT OF THERMODYNAMIC EQUILIBRIUM IN DETONATION WAVES	198
G. B. Kistiakowsky and Walter G. Zinman Harvard University	
ON THE STRUCTURE OF A DETONATION FRONT	216
W. R. Gilkerson and Norman Davidson California Institute of Technology	
HIGH TEMPERATURE THERMODYNAMICS AND GASEOUS DETONATIONS IN MIXTURES OF CYANOGEN, OXYGEN, AND NITROGEN	231
H. M. Peek and R. G. Thrap Los Alamos Scientific Laboratory	
DETONATION IN GASES AT LOW PRESSURE	251
Arthur L. Bennett and Henry W. Wedaa U. S. Naval Ordnance Test Station	
MEASUREMENTS ON GASEOUS DETONATION WAVES	266
J. A. Nicholls, R. B. Morrison, and R. E. Cullen University of Michigan	

STUDIES ON GASEOUS DETONATION	281
B. Greifer, F. C. Gibson, and C. M. Mason	
U.S. Bureau of Mines	
CONDENSATION SHOCKS AND WEAK DETONATIONS	295
S. G. Reed, Jr., and W. H. Heybey	
U.S. Naval Ordnance Laboratory	
THE STRUCTURE OF A STEADY-STATE PLANE DETONATION WAVE WITH FINITE REACTION RATE	312
John G. Kirkwood, Yale University	
William W. Wood, Los Alamos Scientific Laboratory	
THE MEASUREMENT OF CHAPMAN-JOUGUET PRESSURE FOR EXPLOSIVES	327
W. E. Deal, Jr.	
Los Alamos Scientific Laboratory	
MEASUREMENT OF THE CHAPMAN-JOUGUET PRESSURE AND REACTION ZONE LENGTH IN A DETONATING HIGH EXPLOSIVE	342
Russell E. Duff and Edwin Houston	
Los Alamos Scientific Laboratory	
THE DETONATION ZONE IN CONDENSED EXPLOSIVES	358
H. Dean Mallory and S. J. Jacobs	
U.S. Naval Ordnance Laboratory	
CALCULATION OF THE DETONATION PROPERTIES OF SOLID EXPLOSIVES WITH THE KISTIAKOWSKY-WILSON EQUATION OF STATE	383
W. Fickett and R. D. Cowan	
Los Alamos Scientific Laboratory	
A SOLID-STATE MODEL FOR DETONATIONS	404
R. B. Parlin and J. C. Giddings	
University of Utah	
DIAMETER EFFECT IN CONDENSED EXPLOSIVES. THE RELATION BETWEEN VELOCITY AND RADIUS OF CURVATURE OF THE DETONATION WAVE	424
William W. Wood, Los Alamos Scientific Laboratory	
John G. Kirkwood, Yale University	
THE DETONATION BEHAVIOR OF LIQUID TNT	439
E. A. Igel and L. B. Seely, Jr.	
Los Alamos Scientific Laboratory	
DETONATION IN HOMOGENEOUS EXPLOSIVES	454
A. W. Campbell, M. E. Malin, and T. E. Holland	
Los Alamos Scientific Laboratory	

PARTICLE SIZE EFFECTS IN ONE- AND TWO-COMPONENT EXPLOSIVES	478
M. E. Malin, A. W. Campbell, and C. W. Mautz Los Alamos Scientific Laboratory	
DETONATION WAVE FRONTS IN IDEAL AND NON-IDEAL DETONATION . .	500
Melvin A. Cook University of Utah	
DETERMINATION OF REACTION RATE OF SODIUM NITRATE AND THE EQUATION OF STATE OF 50/50 TNT-NaNO ₃	519
Melvin A. Cook and Wayne O. Ursenbach University of Utah	
THE DECOMPOSITION OF ALPHA-LEAD AZIDE	529
J. M. Grocock C.S.A.R., Ministry of Supply, Great Britain	
THE DETONATION OF AZIDES BY LIGHT	547
J. S. Courtney-Pratt and G. T. Rogers University of Cambridge	
DETONATION IN AZIDES WHEN THE DIMENSIONS ARE COMPARABLE WITH THE LENGTH OF THE REACTION ZONE	561
F. P. Bowden and A. C. McLaren University of Cambridge	
ORIGIN OF LUMINOSITY IN DETONATION FLAMES	571
Elwyn Jones Imperial Chemical Industries Limited, Scotland	
THE ROLE OF GAS POCKETS IN THE PROPAGATION OF LOW VELOCITY DETONATION	582
Owen A. J. Gurton Imperial Chemical Industries Limited, Scotland	
SENSITIVENESS TO DETONATION	601
Elwyn Jones and Ian G. Cumming Imperial Chemical Industries Limited, Scotland	
INITIATION OF MILITARY EXPLOSIVES BY PROJECTILE IMPACT . . .	612
J. M. Dewey Aberdeen Proving Ground	
FACTORS AFFECTING THE TRANSMISSION OF DETONATION BETWEEN SMALL EXPLOSIVE CHARGES	620
L. D. Hampton, J. Savitt, L. E. Starr, and R. H. Stresau U.S. Naval Ordnance Laboratory	
THE CORRELATION OF THE SENSITIVENESS OF EXPLOSIVES WITH COMBUSTION DATA	643
E. G. Whitbread and L. A. Wiseman Ministry of Supply, England	

PROBLEMS OF INITIATION IN TESTS OF SENSITIVENESS	695
E. G. Whitbread Ministry of Supply, Great Britain	
LEAD AZIDE PRECIPITATED WITH POLYVINYL ALCOHOL	711
T. Gaynor Blake, Olin Mathieson Chemical Corporation Donald E. Seeger, Picatinny Arsenal Richard H. Stresau, U.S. Naval Ordnance Laboratory	
THERMO-HYDRODYNAMICS AND REACTION KINETICS IN SOME METALIZED EXPLOSIVES	733
Melvin A. Cook, Aaron S. Filler, Robert T. Keyes, William S. Partridge, and Wayne O. Ursenbach University of Utah	
CONDITIONS BEHIND THE REACTION ZONE OF CONFINED COLUMNS OF EXPLOSIVE - NOTIONS DERIVED FROM PLATE DENT EXPERIMENTS	749
W. M. Slie and R. H. Stresau U.S. Naval Ordnance Laboratory	
INDEX TO AUTHORS	776