

Numerical Modeling Of Detonations

C.-O. Leiber

Numerical Modeling Of Detonations:

Numerical Modeling of Detonations Charles L. Mader, 1979 **Numerical Modeling of Explosives and Propellants** Charles L. Mader, 2007-10-18 Major advances both in modeling methods and in the computing power required to make those methods viable have led to major breakthroughs in our ability to model the performance and vulnerability of explosives and propellants In addition the development of proton radiography during the last decade has provided researchers with a major new experimental tool for studying explosive and shock wave physics Problems that were once considered intractable such as the generation of water cavities jets and stems by explosives and projectiles have now been solved Numerical Modeling of Explosives and Propellants Third Edition provides a complete overview of this rapidly emerging field covering basic reactive fluid dynamics as well as the latest and most complex methods and findings It also describes and evaluates Russian contributions to the experimental explosive physics database which only recently have become available This book comes with downloadable resources that contain FORTRAN and executable computer codes that operate under Microsoft Windows Vista operating system and the OS X operating system for Apple computers Windows Vista and MAC compatible movies and PowerPoint presentations for each chapter Explosive and shock wave databases generated at the Los Alamos National Laboratory and the Russian Federal Nuclear Centers Charles Mader's three pronged approach through text computer programs and animations imparts a thorough understanding of new computational methods and experimental measuring techniques while also providing the tools to put these methods to effective use **Dynamic Aspects of Detonations** A. L. Gaseous Detonation Physics and Its Universal Framework Theory Zonglin Jiang, Honghui Kuhl,1993 Teng, 2022-12-16 This book highlights the theories and research progress in gaseous detonation research and proposes a universal framework theory that overcomes the current research limitations Gaseous detonation is an extremely fast type of combustion that propagates at supersonic speed in premixed combustible gas Being self sustaining and self organizing with the unique nature of pressure gaining gaseous detonation and its gas dynamics has been an interdisciplinary frontier for decades The research of detonation enjoyed its early success from the development of the CJ theory and ZND modeling but phenomenon is far from being understood quantitatively and the development of theories to predict the three dimensional cellular structure remains a formidable task being essentially a problem in high speed compressible reacting flow This theory proposed by the authors research group breaks down the limitation of the one dimensional steady flow hypothesis of the early theories successfully correlating the propagation and initiation processes of gaseous detonation and realizing the unified expression of the three dimensional structure of cell detonation. The book and the proposed open framework is of high value for researchers in conventional applications such as coal mine explosions and chemical plant accidents and state of the art research fields such as supernova explosion new aerospace propulsion engines and detonation driven hypersonic testing facilities It is also a driving force for future research of detonation Proceedings, Seventh Symposium (International) on

Detonation ,1982 Assessment of Safety and Risk with a Microscopic Model of Detonation C.-O. Leiber, 2003-04-25 This unique book is a store of less well known explosion and detonation phenomena including also data and experiences related tosafety risks It highlights the shortcomings of the currentengineering 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 arenew Some even date back to the 19th century or earlier What is newis the application of these approaches to explosion phenomena Inorder to make these tools easily available to the current detonationphysicist basic acoustics is therefore also addressed Whereas the current plane wave homogeneous flow detonation physicsis an excellent engineering tool for numerical predictions undergiven conditions the multi hot spot model is an additional tool for analyzing phenomena that cannot be explained by classicalculations 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 thedetonics 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 evenliquid carbon dioxide and inert silo materials can explode A unique collection of unexpected events which might surprise evenspecialists has resulted from the evaluation of the model Thereforethis book is valuable for each explosion and safety scientist for the understanding and forecasting of unwanted events The text mainlyaddresses the next generation of explosion and detonation scientists with the goal of promoting the science of detonation on a newphysical basis For this reason gaps in current knowledge are also addressed The science of explosions is not fully mature but isstill in its beginning and the tools necessary for furthering theunderstanding of these phenomena have Scientific and Technical Aerospace Reports, 1992 been with us for centuries The Detonation Phenomenon John H. S. Lee, 2008-06-30 This book introduces the detonation phenomenon in explosives It is ideal for engineers and graduate students with a background in thermodynamics and fluid mechanics. The material is mostly qualitative aiming to illustrate the physical aspects of the phenomenon Classical idealized theories of detonation waves are presented first These permit detonation speed gas properties ahead of and behind the detonation wave and the distribution of fluid properties within the detonation wave itself to be determined Subsequent chapters describe in detail the real unstable structure of a detonation wave One two and three dimensional computer simulations are presented along with experimental results using various experimental techniques The important effects of confinement and boundary conditions and their influence on the propagation of a detonation are also discussed The final chapters cover the various ways detonation waves can be formed and provide a review of the outstanding problems and future directions in detonation research **Shock Waves Science** and Technology Library, Vol. 6 F. Zhang, 2012-03-19 This book as a volume of the Shock Wave Science and Technology

Reference Library is primarily concerned with the fundamental theory of detonation physics in gaseous and condensed phase reactive media The detonation process involves complex chemical reaction and fluid dynamics accompanied by intricate effects of heat light electricity and magnetism a contemporary research field that has found wide applications in propulsion and power hazard prevention as well as military engineering The seven extensive chapters contained in this volume are Chemical Equilibrium Detonation S Bastea and LE Fried Steady One Dimensional Detonations A Higgins Detonation Instability HD Ng and F Zhang Dynamic Parameters of Detonation AA Vasiliev Multi Scaled Cellular Detonation D Desbordes and HN Presles Condensed Matter Detonation Theory and Practice C Tarver Theory of Detonation Shock Dynamics JB Bdzil and DS Stewart The chapters are thematically interrelated in a systematic descriptive approach though each chapter is self contained and can be read independently from the others It offers a timely reference of theoretical detonation physics for graduate students as well as professional scientists and engineers 30th International Symposium on Shock Waves 1 Gabi Ben-Dor, Oren Sadot, Ozer Igra, 2017-08-09 These proceedings collect the papers presented at the 30th International Symposium on Shock Waves ISSW30 which was held in Tel Aviv Israel from July 19 to July 24 2015 The Symposium was organized by Ortra Ltd The ISSW30 focused on the state of knowledge of the following areas Nozzle Flow Supersonic and Hypersonic Flows with Shocks Supersonic Jets Chemical Kinetics Chemical Reacting Flows Detonation Combustion Ignition Shock Wave Reflection and Interaction Shock Wave Interaction with Obstacles Shock Wave Interaction with Porous Media Shock Wave Interaction with Granular Media Shock Wave Interaction with Dusty Media Plasma Magnetohyrdrodynamics Re entry to Earth Atmosphere Shock Waves in Rarefied Gases Shock Waves in Condensed Matter Solids and Liquids Shock Waves in Dense Gases Shock Wave Focusing Richtmyer Meshkov Instability Shock Boundary Layer Interaction Multiphase Flow Blast Waves Facilities Flow Visualization and Numerical Methods The two volumes serve as a reference for the participants of the ISSW30 and anyone interested in these fields Dynamic Aspects of Explosion Phenomena A. L. Kuhl, 1993 Effects of fuel distribution on detonation tube performance, Dynamics of Heterogeneous Combustion and Reacting Systems A. L. Kuhl, 1993 History of Shock Waves, Explosions and Impact Peter O. K. Krehl, 2008-09-24 This unique and encyclopedic reference work describes the evolution of the physics of modern shock wave and detonation from the earlier and classical percussion The history of this complex process is first reviewed in a general survey Subsequently the subject is treated in more detail and the book is richly illustrated in the form of a picture gallery This book is ideal for everyone professionally interested in shock wave phenomena Shock Waves Klaus Hannemann.Friedrich Seiler, 2009-04-01 The 26th International Symposium on Shock Waves in G ttingen Germany was jointly organised by the German Aerospace Centre DLR and the French German Research Institute of Saint Louis ISL The year 2007 marked the 50th anniversary of the Symposium which first took place in 1957 in Boston and has since become an internationally acclaimed series of meetings for the wider Shock Wave Community The ISSW26 focused on the following areas Shock Propagation and

Reflection Detonation and Combustion Hypersonic Flow Shock Boundary Layer Interaction Numerical Methods Medical Biological and Industrial Applications Richtmyer Meshkov Instability Blast Waves Chemically Reacting Flows Diagnostics Facilities Flow Visualisation Ignition Impact and Compaction Multiphase Flow Nozzles Flows Plasmas and Propulsion The two Volumes contain the papers presented at the symposium and serve as a reference for the participants of the ISSW 26 and individuals interested in these fields **Dynamics of Detonations and Explosions** A. L. Kuhl, 1991 Publications of the U.S. Army Engineer Waterways Experiment Station U.S. Army Engineer Waterways Experiment Rock Fragmentation by Blasting Jose A. Sanchidrian, 2009-08-20 This volume contains the papers presented at the 9th International Symposium on Rock Fragmentation by Blasting held in Granada Spain 13 17 August 2009 A state of the art collection of articles on developments in rock blasting and explosives engineering with contributions on rock characterization explosives and initiation systems blast design and monitoring fragmentation assessment numerical modeling vibrations from blasting environmental and economical aspects of rock blasting and more Containing unique knowledge case studies ideas and insights this volume is must have literature for researchers and practitioners in the field of explosives and **Detonation Control for Propulsion** Jiun-Ming Li, Chiang Juay Teo, Boo Cheong Khoo, Jian-Ping Wang, Cheng blasting Wang, 2017-12-05 This book focuses on the latest developments in detonation engines for aerospace propulsion with a focus on the rotating detonation engine RDE State of the art research contributions are collected from international leading researchers devoted to the pursuit of controllable detonations for practical detonation propulsion A system level design of novel detonation engines performance analysis and advanced experimental and numerical methods are covered In addition the world's first successful sled demonstration of a rocket rotating detonation engine system and innovations in the development of a kilohertz pulse detonation engine PDE system are reported Readers will obtain in a straightforward manner an understanding of the RDE PDE design operation and testing approaches and further specific integration schemes for diverse applications such as rockets for space propulsion and turbojet ramjet engines for air breathing propulsion Detonation Control for Propulsion Pulse Detonation and Rotating Detonation Engines provides with its comprehensive coverage from fundamental detonation science to practical research engineering techniques a wealth of information for scientists in the field of combustion and propulsion The volume can also serve as a reference text for faculty and graduate students and interested in shock waves combustion and propulsion **Detonation Phenomena of Condensed Explosives Shiro** Kubota, 2023-01-13 This book presents fundamental theory of shock and detonation waves as well as selected studies in detonation research in Japan contributed by selected experts in safety research on explosives development of industrial explosives and application of explosives It also reports detonation research in Japan featuring industrial explosives that include ammonium nitrate based explosives and liquid explosives Intended as a monographic style book it consistently uses technical terms and symbols and creates organic links between various detonation phenomena in application of explosives

fundamental theory of detonation waves measurement methods and individual studies Among other features the book presents a historical perspective of shock wave and detonation research in Japan pedagogical materials for young researchers in detonation physics and an introduction to works in Japan including equations of state which are worthy of attention but about which very little is known internationally Further the concise pedagogical chapters also characterize this book as a primer of detonation of condensed explosives and help readers start their own research

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