

Preface

The topic of detonation-based propulsion spans several disciplines in basic and applied sciences, in particular, combustion, detonation physics, and chemistry, heat and mass transfer, material science, and mechanical engineering. Research prototypes of pulse and continuous detonation engines are being developed worldwide with possible applications in a variety of propulsion units: from microthrusters for orbital orientation to afterburners in jet engines. Despite these efforts involving state-of-the-art knowledge and technologies, it is clear that the nonconventional performance goals imply the requirement of novel intelligent approaches and technologies to be imbedded in this type of propulsion systems. Standard diagnostics and performance measurement techniques utilized in conventional propulsion units are not adequate for highly transient and harsh detonation processes. While, in theory, detonation propulsion indicates enormous practical significance and potential, there are still many important questions that arise when examining the test results of existing research prototypes. For example: Can detonation engines become a practical reality? Can detonation engines significantly improve the performance of air-breathing or rocket cycle? What is the major advantage of detonation propulsion over competing technologies? What additional knowledge is required to design such engines? These and related other questions are still not answered adequately.

During the period from 1998 to 2006, the U.S. Office of Naval Research* (ONR) and the Russian Foundation for Basic Research (RFBR) have jointly sponsored five International colloquia on detonations, in particular, those aspects of detonations that are directly relevant to the development of pulse detonation engines (PDEs). In 1998, the International Colloquium on Advances in Experimentation and Computation of Detonations was held in St. Petersburg with the participation of more than 60 experts. In 2000, the International Colloquium on Control of Detonation Processes was organized in Moscow with more than 100 participants. The International Colloquium on Advances in Confined Detonations was held in Moscow in 2002 with more than 120 participants.

*The content of the information does not necessarily reflect the position or the policy of the United States Government and no official endorsement should be inferred.

In 2004, the International Colloquium on Application of Detonation for Propulsion has been organized in St. Petersburg with more than 100 participants. As a result of these meetings, a number of books have been published containing revised and edited extended abstracts of all presentations and full edited manuscripts of selected papers presented at the colloquia. Finally, in 2006, the Fifth International Colloquium on Pulsed and Continuous Detonations has been organized in Moscow. The international scientific community responded actively with more than 70 papers authored by international experts from 11 countries: Belarus, France, Israel, Japan, Poland, R. Korea, Russia, Sweden, U.K., Ukraine, and USA.

Similar to our efforts with all previous colloquia, we have endeavored to revise, thoroughly edit, and publish in this volume the condensed versions (extended abstracts) of the papers presented at the Colloquium-2006. All the material in the volume is subdivided to four topical sections: (1) Transient Combustion Phenomena; (2) Detonations; (3) Pulse Detonation Engines; and (4) Continuous Detonation Engines. The book addresses fundamental and technological issues related to pulse and continuous detonation propulsion. Extended up-to-date references as well as authors' affiliations are added so that further information can be readily obtained. To make reading more convenient, an author index is provided at the end of the book. The volume is intended as a reference tool for practicing engineers, research scientists working in the field of combustion and propulsion, and graduate students studying the corresponding disciplines.

The Colloquium and this volume are the outcome of hard work of several individuals, and we appreciate their valuable contributions. In particular, we acknowledge the assistance given at various stages by Ms. Olga Frolova. We thank the staff of TORUS PRESS Publishers for their excellent service in producing the volume and organizing the conference.

We wish to thank the authors for their time and effort in preparing their papers and participation in the Colloquium. Special thanks are due to Academician A. A. Berlin, Academician A. G. Merzhanov, Prof. A. V. Veretennikov and Prof. S. A. Tsyganov for their valuable contribution to the organization of the Colloquium. The sponsoring agencies, ONR, RFBR, International Science and Technology Center, and Federal State Enterprise "The Federal Center for Dual-Use Technologies

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"Soyus," are gratefully acknowledged for their financial support, without which this endeavor would not be possible. We do hope that this volume will serve as a useful addition to the literature on detonation and propulsion.

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