

Preface

Studies on detonation, particularly pertaining to pulse detonation engines (PDE) have significantly increased during the past few years. The global interest in the development of PDEs for propulsion is evident from the formation of collaborative teams by industry both in the US and in Europe. Sessions in PDEs are becoming very popular in combustion-related technical meetings and conferences.

The US Office of Naval Research (ONR) and the Russian Foundation for Basic Research have been the principal sponsors in fundamental research on detonation. The International Colloquium on Advanced Experimentation and Computation of Detonations, held in 1998 at St. Petersburg, Russia, jointly sponsored by these organizations, in association with ONR International Field Office Europe, European Research Office of the U.S. Army, and ENAS Co., has further strengthened the awareness of this forefront in technology, and provided a forum for dialogue among experts. This also offered the opportunity to revisit the wheel that has been invented and not to reinvent it, but rather to improve upon it and to apply it for more useful and practical purposes.

Devices utilizing pulse detonations have a wide variety of applications, which include ice-breaking, drilling, propulsion, etc. The near-constant volume operational cycle of PDE provides a higher thermodynamic efficiency as compared to conventional Brayton (constant pressure) cycle used in gas turbines. The advantages of PDE for propulsion are simplicity and scaling, which will result in reduced development time and cost; subsonic to supersonic operation with a single engine, which will eliminate the booster to bring up to ram speed and reduce cost; and reduced fuel consumption, which will reduce operational cost and increase range for the same fuel tank volume. However, control of single and successive detonations is required to realize these advantages.

Encouraged by the enthusiasm shown by the research community, a follow-on Colloquium on Control of Detonation Processes has been organized. The sponsors for the Colloquium are the US Office of Naval Research*, the ONR International Field Office Europe*, European Research Office of the US Army*, Russian Foundation for Basic Research,

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and Scientific Council on Combustion and Explosion of the Presidium of the Russian Academy of Sciences. The response from the scientific community has been overwhelming — 13 countries participating with over 60 high-quality papers.

Since making a full publication of the edited papers and make it available during the Colloquium is a formidable task during the short time ahead, we have endeavored to publish a condensed version/extended abstracts of the papers that will be presented in the Colloquium. This compilation of condensed articles is under the following sections: (1) Control of Deflagration to Detonation Transition (DDT) in Gaseous Systems, (2) Control of DDT in Heterogeneous Systems, (3) Control of Detonation Initiation and Propagation, (4) Transient Heat Transfer and Diagnostics of Explosion Processes, and (5) Pulsed Detonation Engines, gives a quick overview of the state-of-the-art in detonation control and its applications. Limited references are added, but further information can be obtained from the authors. Since control of detonation processes is the next appropriate step in transitioning this technology to applications, this volume is prepared as a reference for practicing engineers and research scientists working in the field of combustion and propulsion.

The Colloquium and this volume are the outcome of hard work of several persons, and we appreciate their contributions. In particular, we acknowledge the assistance given at various stages by Ms. Mary Keegan and Ms. Olga Frolova. We thank the staff of Elex-KM Publishers for their excellent service in producing the volume.

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