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Preface

SOLID-PROPELLANT rocket motors have been widely used for primary propulsion and auxiliary power-generation systems in missiles, spacecrafts, and space launch vehicles for more than five decades. Although the basic concepts are well established, researchers are continuously challenged by many fluid mechanics and combustion problems arising in rocket motors. Huge technological investments are required to achieve a thorough understanding of the physico-chemical processes involved and to ensure functional maturity of hardware devices.

The current knowledge base of solid-propellant combustion and rocket-motor interior ballistics contains many voids that must be filled to promote comprehensive insight into this topic. Existing works are scattered throughout various journals, technical papers, conference proceedings, and progress reports. There is a distinct need for more effective communication and an organized effort to confront the technological problems at hand. A few outstanding books have been published in the area of solid-propellant combustion over the past decade, including *Fundamentals of Solid-Propellant Combustion*, edited by K. Kuo and M. Summerfield, published as an AIAA Progress in Astronautics and Aeronautics series volume in 1984; *Chemistry and Physics of Energetic Materials*, edited by S. N. Bulusu, published by Kluwer Academic Publication in 1990; and *Nonsteady Burning and Combustion Stability of Solid Propellants*, edited by L. DeLuca et al., published as an AIAA Progress in Astronautics and Aeronautics series volume in 1992. All of these books have proven useful and have provided valuable information, especially when first published. However, continuing developments in computational and experimental techniques, coupled with a number of practical experiences with full-scale rocket motors worldwide, have produced rapid advancement of the state-of-the-art. Thus, the present issue will serve as an excellent extension to the prior work, and is intended to be used as a major reference by engineers and scientists in the field of solid rocket propulsion.

The volume embraces the following three subject areas: 1) solid-propellant rocket motor interior ballistics, 2) combustion of solid energetic materials, and 3) the development of high energetic materials. A total of 30 papers prepared by experts in the respective subject areas have been included, with the goal of providing a well-rounded balance of fundamental scientific and technological works. Each paper focuses on a specific aspect of solid-propellant combustion and motor interior ballistics, and is incorporated into the volume in a cohesive fashion. A noteworthy feature of this issue is that it contains contributions from nine different countries, including China, France, India, Italy, Japan, The Netherlands, Russia, Taiwan, and the United States. By presenting findings of many independent research programs from around the world, this issue provides a comprehensive and objective survey of the results obtained to date. The ten papers from Russia appear to be the first detailed technical information of this sort provided by the Russians in the open literature. The present issue is rather unique in this sense. The world has changed drastically over the last five years, and scientific cooperation, now free from political and ideological barriers, is being intensified!

Many individuals have contributed directly and indirectly to the content of this Special Issue. We owe a large debt of gratitude to all of the authors for their expertise, hard work, and cooperation in bringing this volume to fruition. We wish to express our sincere thanks to Woody Waesche, the editor-in-chief of the *Journal of Propulsion and Power*, for his extremely valuable support and encouragement throughout this effort. In addition to providing administrative facility, he amazingly reviewed and offered constructive comments on all thirty papers published in this volume. The significant contributions of many reviewers, whose suggestions and corrections added to the quality of the various papers, are also gratefully acknowledged.

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