

New books on physics and related sciences

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Fortov V E, Filinov V S, Larkin A S, Ebeling W *Statistical Physics of Dense Gases and Nonideal Plasma* (Moscow: Fizmatlit, 2020) 712 p. ISBN 978-5-9221-1885-9.

This book is based on university lectures and presentations at seminars and international conferences, on many original publications, and, in particular, on the long collaboration among the authors that began in the 1970s. The book is concentrated on developing the basic principles of statistical physics and applications to gas and plasma, including dense nonideal and exotic gas and plasma. These delimitations are important for the authors because most modern textbooks and monographs on quantum statistics have a certain bias towards condensed matter and, specifically, solid-state systems. The results presented in the book have been obtained quite recently. The book will be useful to senior students, those working on a doctor's degree, and young researchers in this field of science. (Fizmatlit publishers: tel. +7 (495) 005-32-79; URL: <http://www.fml.ru/>, <https://www.fmlib.ru/>)

Son E E, Fortov V E, Azmeev Kh Kh, Aksenov A A, Bondar' V S, Babaeva N Yu, Gadzhiev M Kh, Zitserman V Yu, Kiverin A D, Korobeinikov S M, Kulikov Yu M, Mintsev V B, Panov V A, Smirnov B M, Temis Yu M, Tyuftyaev A S *Electrophysics and Explosion Safety of High-Voltage Oil-Filled Electric Equipment* (Moscow: RAN, 2019) 420 p. ISBN 978-5-907036-35-2.

This monograph is devoted to fundamental questions of the electrophysics of high-voltage phenomena in gas-liquid systems, gas formation, and the occurrence of partial discharges in high-voltage insulating liquids. Results of experimental studies of the electrophysical properties of transformer oil in a mixture with air and insulating gas and of vegetable oils are presented, and experimental and theoretical results concerning the thermophysical properties of transformer oil obtained on shock tubes in the range of high pressures up to 10 GPa are given. The monograph describes the methods of numerical simulation of hydrodynamics and heat exchange in high-voltage equipment, shows that transformer oil is a thermoviscous liquid, considers the designed moduli of Flow Vision and Gas Dynamic Tool program packages for modeling stationary states and explosions of high-voltage facilities, and describes methods of modeling fast processes, explosions, and the kinetics of the stressed deformed state of destructible electric equipment, dynamical methods of safeguarding the nonexplosiveness of high-voltage oil-filled equipment using dynamical systems of depressurization and explosion product dumping and dam-

per systems of protection by porous metals, and the formation of a compressible medium with replacement of the shock wave by a time- and space-distributed increase in pressure to the frame. The proposed methods may underlie new solutions and technologies for designing nonexplosive high-voltage equipment. Some papers on this subject were published in Russia and in the global literature, but this monograph is the first one devoted to electrophysical processes and the analysis and modeling of explosions of transformers and other high-voltage oil-filled equipment. The monograph will be of use for engineers, researchers, post-graduates, and students of energy and physico-mathematical specialties in universities and institutes. The preparation of the monograph was supported by the Russian Science Foundation, grant 19-49-02031. (<http://www.ras.ru/FStorage/download.aspx?id=fa99e495-b40e-4245-a78a-b27561d3c498>)

Fortov V E *Thermodynamics of the Dynamical Action on Matter* (Moscow: Fizmatlit, 2019) 144 p. ISBN 978-5-9221-1840-8.

The types of phase transitions accessible for realization in intense waves of isentropic compression and expansion and in powerful shock waves are considered on the basis of general thermodynamic relations. The consideration only involves the presence of local thermodynamic equilibrium in the system. The proposed formalism was used to study melting, high-temperature boiling, and plasma phase transitions by dynamical methods. The thermodynamic conditions of the occurrence of shock-explosion instabilities in a medium with an arbitrary equation of state were formulated depending on the thermodynamic properties of the substance. The book is intended for a wide range of specialists engaged in applied physics and new technology, as well as for all physicists and engineers interested in modern high energy density physics. (Fizmatlit publishers: tel. +7 (495) 005-32-79; URL: <http://www.fml.ru/>, <https://www.fmlib.ru/>)

Fortov V E *Intense Shock Waves on the Earth and in Space* (Moscow: Fizmatlit, 2018) 416 p. ISBN 978-5-9221-1793-7.

This monograph is devoted to various physical manifestations and properties of intense shock waves. The main focus is on nontraditional areas of physics and the mechanics of shock waves, which arose rather recently owing to an intense study of these waves in very different media — from nuclear matter to galactic clusters. Considered are ways of generation and diagnostics, as well as theoretical methods to describe shock waves at extremely high pressures and temperatures under laboratory and quasi-laboratory conditions. The state of substances with a high energy density, accessible for shock-wave compression, is discussed. An attempt is made to systemize and generalize the extensive theoretical and experimental material of high energy density physics — the physics

and mechanics of intense shock waves—and to present it from a unified viewpoint. The book is based on the lectures delivered by the author at the Moscow Institute of Physics and Technology and the Higher School of Physics of Rosatom and on review talks at numerous scientific conferences and symposia. The book may be of interest for a wide range of scientists, postgraduates, and students of natural-science specialties and makes original work accessible to them, allowing readers to come to know the attractive problems of the modern science of shock waves. (Fizmatlit publishers: tel. +7 (495) 005-32-79; URL: <http://www.fml.ru/>, <https://www.fmlib.ru/>).

Fortov V E, Makhutov N A, Moskvichev V V, Fomin V M *Machine-building Industry of Russia: Technology in Siberia, the North, and the Arctic. Monograph* (Krasnoyarsk: Siberian Federal University, 2018) 178 p. ISBN 978-5-7638-3966-1.

The state of, goals of, problems with, and prospects for the development of engineering and technologies in regions of Siberia and the Arctic that are the most important for Russia are considered. Presented are the main features of the resource potential in these regions and scientific methodological bases for creating and exploiting technologies for the North, including issues of natural technogeneous safety, analyses of failures and destruction, and an experimental computational assessment of durability, resource, and reliability indicators. The results of solutions to applied problems of low-temperature durability, machine resources, and construction for different goals are reviewed. The main avenues in the development of research and the normative base of the design, production, and exploitation of technical facilities to be used in the North, which correspond to the strategy of national security, are given. The monograph is included in the list of publications of the Division of Energetics, Machine Building, Mechanics, and Control Processes of RAS for the prognosis of the development of technical sciences in Russia. The book was published by a resolution of the Academic Council of the Polytechnical Institute of the Siberian Federal University and the Krasnoyarsk branch of the Institute of Computational Technologies of SB RAS. The book is intended for specialists, technical engineers of the machine-building sector, scientists, postgraduates, and students engaged in studies in machine-building disciplines. (<http://research.sfu-kras.ru/publications/publication/41830978>)

Fortov V E, Baturin Yu M, Morfill G O, Petrov O F *Plasma Crystal. Space Experiments. Statement, Experimentation, Practical Applications. Russian-German Scientific Program* (Moscow: Fizmatlit, 2015) 272 p. ISBN 978-5-9221-1651-0.

Studies of plasma crystals carried out from 2001 to 2014 by Russian and German scientists and cosmonauts on the International Space Station are described. In the course of experiments, some new effects and phenomena were revealed that have not been observed under conditions of Earth's gravity and that provide deeper insight into the structure and dynamics of matter. The book will be useful for specialists in dust plasma physics and for all those interested in the latest space experiments and the organization and practice of cosmic studies. (Fizmatlit publishers: tel. +7 (495) 005-32-79; URL: <http://www.fml.ru/>, <https://www.fmlib.ru/>)

Notes on Science: Collection of Selected Papers and an Interview with the President of the Russian Academy of Sciences, Academician V E Fortov. (Compiled by O A Gorokhovskaya) (Moscow: RTSOFT-COSMOSCOP, 2016) 267 p. ISBN 978-5-903545-36-0.

This is a collection of selected papers and an interview with the President of the Russian Academy of Sciences, Academician V E Fortov. Difficult periods in the formation and development of Russian science and the activity of the academy under current RAS reforms are described. V E Fortov also speaks about himself, his scientific research, and his teachers. The publication will be interesting for those working at the Russian Academy of Sciences, scientists, teachers, students, and a wide range of readers not indifferent to the fate of Russian science. (<https://www.ozon.ru/product/zametki-o-nauke-334188959/?sh=76nmTmSJ>)

Fortov Vladimir Evgenyevich (Materials for a bibliography of scientists. Physical Sciences, Issue 45, comp. A P Likhachev et al.; author of introductory article: G A Mesyats) (Moscow: Nauka, 2006) 158 p. ISBN 5-02-033191-0.

This issue is devoted to academician V E Fortov—an outstanding Russian scientist, organizer of science, supreme specialist in high energy density physics, chemical physics, nonideal plasma physics, pulse energy, and cosmic physics. It contains a profile of the life and creative activity of the scientist, a list of his works, and dates in his life and activity. The book contains reference sources. It is intended for specialists and historians of science. (Nauka publishers: +7(495) 276-77-35, e-mail: info@naukaran.com, URL: <https://naukapublishers.ru/>)

Trajectory: Vladimir Fortov (Ed. S V Fortova) (Moscow: Joint International Biographic Center, 2015)

Vladimir Evgenyevich Fortov was a prominent scientist and organizer of science, president of the Russian Academy of Sciences from 2013 to 2017, director and then research supervisor of the Joint Institute for High Temperatures of RAS, a laureate of State Prizes, and a full recipient of the order For Merit to the Fatherland. In the collection of notes and essays prepared in connection with the 70th birthday of academician V E Fortov by his daughter Svetlana, an attempt is made to gather in one place photos and brief comments on them by colleagues and friends of Vladimir Fortov describing different details of his scientific and life trajectory. (<https://scientificrussia.ru/articles/traektoriya-vladimira-fortova>)

Twenty-First President of the Russian Academy of Sciences, Vladimir Fortov (Author of the project: S V Fortova, Ed. S V Fortova, author of the text and editor: M I Yakubovich) (Moscow, 2021)

The issue was prepared on the initiative of V E Fortov's daughter Svetlana Vladimirovna Fortova on the occasion of his 75th birthday jubilee. This book is a logical continuation of the first book about Vladimir Evgenyevich Fortov under the title *Traektoriya (Trajectory: Vladimir Fortov)*. (<http://www.icad.org.ru/?p=988>)

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