

## New books on physics and related sciences

DOI: 10.1070/PU2002v045n02ABEH001096

**Sidorkin A S** *Domain Structure in Ferroelectrics and Related Materials* (Moscow: Fizmatlit, 2000) 240 pp. Bibliography: 257 refs. ISBN 5-9221-0095-5. RFBR project 00-02-30015d.

This book examines domain structuring due to the loss of the initial phase stability in materials of finite size. It provides an analysis of domain and interphase boundaries within the continuous approximation and presents the results of the microscopic description of domain boundary structures for a number of ferroelectrics. It also covers such aspects of the behavior of domain boundaries as their interaction with lattice defects, their structure in real ferroelectrically ordered materials, the effect of the lattice potential relief on their motion, and the flexural and translational components of their dynamics in ferroelectric crystals. The contribution of domain boundaries to the dielectric properties of ferroelectrics and the elastic properties of ferroelectric elastomers is assessed. (Fiziko-Matematicheskaya Literatura MAIK Nauka/Interperiodika Publishing regular mail address: 117864 Moscow, Profsoyuznaya ul. 90)

**Zhukov M F, Cherskiĭ I N, Cherepanov A N, Kovalenko N A, Saburov V P, Galevskii G V, Andrianova O A, Krushenko G G** *Strengthening of Metals, Polymers, and Elastomers with Ultradisperse Plasmachemical Synthesis Powders* (Low-Temperature Plasma Series, Vol. 14, Eds-in-Chief V M Fomin, N Z Lyakhov) (Novosibirsk: Nauka–Siberian Branch RAS Publishing, 1999) 312 pp. Bibliography: 290 refs. ISBN 5-02-031322-7.

This monograph comprehensively reviews theoretical and experimental research into the effects of ultradisperse powders on the properties of metals, polymers, and elastomers. The book presents physical and chemical characteristics of ultradisperse carbides and borides synthesized in a nitrogen plasma flow. It describes the technology for preparing ultradisperse particles and introducing them into a melt, the thermodynamics of particle–liquid metal interactions, and the optimization of the mechanical and operation characteristics of cast metals. Special attention is given to the application of disperse powders as filling agents in electrically conducting polymer composites, i.e. materials which enable the design of higher-efficiency electrical heaters with temperature self-regulation, the preparation of composite materials for tribological purposes and elastomers for use in hermetically sealed high-performance systems. The book is intended for industrial laboratory workers and other specialists in the fields of plasmachemical technology and materials

science, as well as for teachers and undergraduate and post-graduate students in metallurgy, mechanical engineering, and chemical technology. (Siberian Branch RAS Publishing House Nauka regular mail address: 630099 Novosibirsk, ul. Sovetskaya 18)

**Solonenko O P, Alkhimov A P, Marusin V V, Orishich A M, Rakhimyanov Kh M, Salimov R A, Shchukin V G, Kosarev V F** *High-Energy Material Working* (Low-Temperature Plasma Series, Vol. 18, Eds-in-Chief M F Zhukov, V M Fomin) (Novosibirsk: Nauka–Siberian Branch RAS Publishing, 2000) 425 pp. Bibliography: 401 refs. ISBN 5-02-031528-1.

The monograph deals with the scientific foundation and the prospects for practical implementation of current technically important material working techniques. Coverage includes laser material processing, plasma sputtering of coatings, high-frequency pulsed induction hardening of steel articles, combined material working which consists in fast heating of a surface and its ultrasound processing, the problem of creation of powerful electron-beam generators and their impact on processing techniques, and peculiarities of a new method of cold gas-dynamic spraying of coatings. For each technique, its specific features are described, the currently used instrumentation is discussed, and practical applications in mechanical engineering, electrical engineering, applied chemistry, and other areas are illustrated. The book is of interest for undergraduate and post-graduate students as well for researchers, engineers, and other professionals dealing with high-energy processes and material processing technologies. (Siberian Branch RAS Publishing House Nauka regular mail address: 630099 Novosibirsk, ul. Sovetskaya 18)

**Andreev B M, Magomedbekov É P, Rozenkevich M B, Sakharovskii Yu A** *Heterogeneous Tritium-Isotope Exchange Reactions* (General Editor B F Myasoedov) (Moscow: Éditorial URSS, 1999) 208 pp. Bibliography: 333 refs. ISBN 5-8360-0034-4. RFBR project 98-03-46023.

This book summarizes data on heterogeneous tritium-isotope exchange reactions in gas–liquid and gas–solid systems. It outlines the salient features of these reactions and compares the thermodynamic and kinetic properties of tritium compounds with those of deuterium and protium compounds. Attention is especially directed towards the tritium-isotope exchange reactions of interest in solving the ecological problems of nuclear power engineering and in developing the fuel cycle and radiation safety systems for a fusion reactor. The book will provide an invaluable reference source for research workers and engineers who are concerned with tritium isolation and application, the employment of its compounds, and practical issues of radiation safety. (Éditorial URSS Publ.: 113208 Moscow, ul. Chertanovskaya 2/11;

tel./fax (7-095) 135-44-23; tel. (7-095) 135-42-46; e-mail: urss@urss.ru; web site: <http://urss.ru>

**Gribov L A, Mushtakova S P** *Quantum Chemistry* Textbook (Moscow: Gardariki, 1999) 390 pp. ISBN 5-8297-0017-4.

The authors — L A Gribov, Corresponding Member of the Russian Academy of Sciences, and Professor S P Mushtakova — have generalized their experience in teaching quantum chemistry to college and university students. They focus on such aspects as solving the most typical applied problems, the physical principles of quantum chemistry, and some key theoretical propositions without knowledge of which the formal use of numerous commercial computer programs can lead to erroneous results. The background mathematical theory is given only at a level necessary for understanding the operations used in the software tools involved. *Quantum Chemistry* is recommended by the RF Ministry of General and Trade Education as a textbook for students in chemistry and biology and may also be useful for undergraduate and post-graduate students of physics departments and physicochemical institutions who are taking courses in physical chemistry and physics. (UITS ‘Gardariki’: 107120 Moscow, Mel’nikskii per. 8/1; tel. (7-095) 917-29-91; 916-05-64)

**Shapiro B I** *Theoretical Bases of the Photographic Process* (Moscow: Éditorial URSS, 2000) 288 pp. + 8 color insets. Bibliography: 121 refs. ISBN 5-8360-0070-0. RFBR project 99-03-46015.

This book covers the major branches of the theory of the photographic process and discusses modern ideas about the chemistry and physics of photographic processes on the basis of silver halides. It will be of continued use to researchers, engineers, and undergraduate and post-graduate students specializing in scientific and applied photography. (Éditorial URSS Publ.: 113208 Moscow, ul. Chertanovskaya 2/11; tel./fax (7-095) 135-44-23; tel. (7-095) 135-42-46; e-mail: urss@urss.ru; web site: <http://urss.ru>)

**Bakhvalov N S, Lapin A V, Chizhonkov E V** *Numerical Methods in Problems and Exercises* A Manual (Ed. V A Sadovnichii) (Moscow: Vysshaya Shkola, 2000) 190 pp. Bibliography: 16 refs. ISBN 5-06-003684-7.

This manual covers the standard material on approximating functions, numerical integration and differentiation, algebraic problems, the solution of nonlinear equations, and the approximate methods for solving ordinary and partial differential equations. This material is in line with the lecture course for students at the M V Lomonosov MSU Mechanics and Mathematics Department, which in turn follows the textbook *Numerical Methods* by Bakhvalov N S, Zhidkov N P, and Kobel’kov G M. The manual contains the elements of the theory, example problems with solutions, and exercises for self-study. The problems included in the book are grouped according to recommended seminar session themes and help the student to reinforce the material of the theoretical course. The solutions provided for typical problems can be used by students for self-study as well as for mastering the general principles governing the application of computational methods. The worked examples and comments provided by the

authors will help the teacher to choose instructive and interesting college-specific problems for his course. The book is intended for universities, pedagogical colleges, and mathematics-oriented colleges, and can be useful for teachers as well as for all those specialists who are involved with computational mathematics. (GUP Vysshaya Shkola Publ. regular mail address: 101430 Moscow, GSP-4, ul. Neglinnaya 29/14)

**Antonov V F, Chernysh A M, Pasechnik V I, Voznesenskii S A, Kozlova E K** *Biophysics* Textbook for college students (Ed. V F Antonov) 1st ed. (Moscow: Gumanit. Izd. Tsentr VLADOS, 1999) 288 pp. Bibliography: 33 refs. ISBN 5-691-00338-0.

This textbook emphasizes the biophysical nature of the organization and functioning of biological objects at the cell, tissue, organ, and organism-as-a-whole levels. In doing so, it explains the nature of such phenomena as ion exchange, bioelectrogenesis, and the biomechanics of muscle contraction and blood circulation. Much attention is given to methods for modeling biological processes. The book discusses the interaction between the biosphere and environmental physical fields and considers the intrinsic emission of the human organism. Typical texts are presented for each chapter. Two editions of the textbook by the same authors preceded this publication, which is recommended by the Russian Federation Ministry of Education as a textbook for undergraduate courses. (Humanitarian Publishing Center VLADOS: 117571 Moscow, prosp. Vernadskogo 88; e-mail: vlad@dol.ru; web site: <http://www.vlados.ru>)

**Bozhokin S V, Parshin D A** *Fractals and Multifractals* (Izhevsk: RKhD, 2001) 128 pp. ISBN 5-93972-060-9.

This text-book presents an exposition of the basic ideas underlying fractal and multifractal geometry. Various examples of fractal structures may be found in many natural phenomena. Fractal concepts are being successfully applied to the chaotic behavior of dynamic and dissipative nonlinear systems, turbulent liquid flow, the nonuniform distribution of matter in the Universe, cracks and dislocation clusters in solids, electric breakdown, diffusion and aggregation of particles, crystal growth, etc. Many ideas of fractal geometry have found application in economics (exchange rate fluctuations), biology (the morphological structure of different biological objects), and solid state physics (the metal–insulator Anderson transition and other features of disordered systems). The text-book has developed from the lecture courses the authors delivered over various periods at the Physics and Mechanics Department of the St. Petersburg State Technical University for fourth- and fifth-year students learning in biophysics, physics of metals, and solid state spectroscopy. The manual will be useful to undergraduate and post-graduate students in physics disciplines, taking an active interest in current problems of physics. (Scientific Research Center ‘Regular and Chaotic Dynamics’ Publ.: (7-3412) 78-39-33 (Izhevsk); (7-095) 332-48-92 (Moscow); web site: <http://rtd.ru>)

Compiled by *E V Zakharova*