

PACS number: 01.30.Tt

New books on physics and related sciences

DOI: 10.1070/PU2001v044n07ABEH001047

Yaroshchuk I O, Popov G V *Statistical Wave Propagation Modelling for Fluctuating Media* (Vladivostok: Dal'nauka, 2000) 156 pp. Bibliography: 153 refs. ISBN 5-7442-0931-X.

In this monograph, the propagation of acoustic and electromagnetic waves in randomly inhomogeneous media is examined, based on the statistical modelling (Monte Carlo) method, i.e. a technique which yields exact solutions for a number of physically important stochastic wave problems. With this approach, the existing (mainly asymptotic) approximate solutions to stochastic wave equations can be investigated, and new solutions produced. The propagation of plane monochromatic waves in linear and nonlinear fluctuating media is discussed. The book is intended for specialists in acoustics, radiophysics, theoretical and mathematical physics and for all those employing wave propagation theory in their work. (RAS Far Eastern Branch "Dal'nauka" Press regular mail address: 690041 Vladivostok, ul. Radio 7)

Attetkov A V, Gnuskin A M, Pyr'ev V A, Sagidullin G G *Explosion Cutting of Metals* (Moscow: SIP RIA, 2000) 260 pp. Bibliography: 496 refs. ISBN 5-89354-025-5.

In this book, the explosion cutting techniques using extended plated and cumulative charges are surveyed as applied to cutting of various hard materials and metalworks. The book examines the physical foundations governing the cumulation effect, hydrodynamic theory of cumulation, and cumulative punching and offers guidelines for designing cumulative explosive charges of various types (axisymmetric, extended, shell-forming, and those with tapered conic facing) and for developing systems of detonation initiation and detonation wave front shape control. The authors consider the physical principles and mathematical foundations of the theory of explosion signal transmission in discrete transformers built around detonation logic elements and present a detailed discussion of charge designs currently employed in explosion cutting of materials and in the explosive separation of spacecraft and aircraft structural elements. Coverage also includes explosive separation techniques for sheet or plate materials, rod elements and metalwork; utilization of engineered products of various kinds (river boats, sea-going ships, aircraft, armored weaponry); the creation of emergency openings in buildings and constructions; explosive destruction of metals in the metallurgy industry, and technologies for disabling condensate-powered ammunition. For researchers, engineers, technicians, and undergraduate and post-graduate students engaged in the development of new explosion technologies. Explosion and shock physicists will also benefit from this volume. (Press and Publishing Center of the autonomous nonprofit organization 'Engineering Stability and Conversion Problems' affiliated with the Russian Engineering Academy regular mail address: 103918 Moscow, Gazetnyĭ per. 9, str. 4; e-mail: org@sipria.msk.ru)

Pamyatnykh E A, Turov E A *Basic Electrodynamics of Material Media in Alternating and Nonuniform Fields* A college and university handbook (Moscow: Nauka – Fizmatlit, 2000) 240 pp. Bibliography: 30 refs. ISBN 5-02-015556-X.

This handbook has developed from a lecture course in general macroscopic electrodynamics, which has been delivered by the authors for many years in the Physics Department at Ural State University. Based on the spatial and temporal dispersion concepts, the book presents a unified up-to-date discussion of the foundations of the electrodynamics of material media in alternating and nonuniform fields. Only the simplest models of the basic types of media are considered. The simplicity of presentation makes the material accessible to third-year physics and engineering physics students. The book was supported by the 1997 – 2000 special-purpose federal program 'State Support for Higher Education and Basic Science Integration'. Recommended by the RF Ministry of Education as a supplement to college and university students in physics, radiophysics, and materials sciences. The book is intended for students, researchers, and engineers. (Fiziko-Matematicheskaya Literatura RAN Publ. regular mail address: 117071 Moscow, P.O. V-71, Leninskiĭ prospekt 15)

Taganov I N, Sirenek V A *Wave Diffusion* (St. Petersburg: NIIKh StPbGU Publ., 2000) 212 pp. Bibliography: 113 refs. ISBN 5-7997-0184-4.

This book examines developments in both the theoretical and experimental aspects of wave diffusion — a phenomenon which is widespread in nature but which only attracted scientific attention in the 1970s. In the first part of the book, the wave diffusion law — the extension of the classical Fick law to mass transfer with memory — is discussed in the context of the wave properties of matter, known to manifest themselves at all structural levels in nature. In so doing the universal nature of the wave description of motion is interpreted as being due to the special properties of time for which the authors introduced a new 'spiral time model'. In the second part of the book, the wave model of diffusion is used to account for inertia effects in mass transfer processes in glass – diffusant systems. This part also provides solutions for a number of processes and phenomena of different topochemical nature for various geometries and presents calculated results on optimal technological regimes for processes like glass leaching and diffusion-assisted lightguide formation. (Instant Printing Department, Chemical Research Institute, StPbSU regular mail address: 198904 St. Petersburg, Staryĭ Petergof, Universitetskiĭ pr. 2)

Blistanov A A *Crystals in Quantum and Nonlinear Optics* College and university handbook (Moscow: MISIS, 2000) 432 pp. Bibliography: 741 refs. ISBN 5-87623-065-0.

Uspekhi Fizicheskikh Nauk **171** (7) 799 – 800 (2001)
Translated by E G Strel'chenko

This book examines the fabrication, structure, structural imperfections, and properties of crystals used in laser, nonlinear, and acousto-optics. It briefly describes the physics of the phenomena which underlie crystal applications, thus enabling necessary crystal quality criteria to be derived. The theory of the phenomena is presented at a level which is accessible to materials science students, while at the same time allowing an assessment of the properties and quality of a crystal. Preparing thin crystalline layers is a highly topical subject in connection with the development of integrated optics. Approved by the RF Ministry of Education as a textbook for college and university students in the disciplines of applied physics, electronics and microelectronics as well as for those taking a course in microelectronics and solid-state electronics under the 'Electronics and Microelectronics' graduate program. The handbook will be useful to material scientists concerned with the preparation and investigation of optical single crystals. (MISIS Publ. regular mail address: 117936 GSP Moscow, P.O. V-49, Leninskiĭ pr. 4)

Kaldybaev K A, Konstantinova A F, Perekalina Z B *Gyrotropy of Absorbing Uniaxial Crystals* (Moscow: ISPIN Publ., 2000) 300 pp. Bibliography: 350 refs. ISBN 5-93576-002-9.

In this book, complex investigations into the optical properties of crystals are discussed. The book focuses on gyrotropy in absorbing uniaxial crystals of various symmetry classes and examines the way in which impurities of iron-group ions affect the gyrotropic properties of optical crystals and how X-ray radiation affects optically active centres. Key devices are described, research methodologies discussed, and experimental data on crystals of practical importance presented. For researchers, engineers, teachers, and undergraduate and postgraduate students involved in the study and application of crystals. (Publishing House of the Institute of Social, Economical, Production, and Ecological Investment Problems contact information: (7-095) 246-5403, (7-095) 246-6487)

Rusakov V S *Mössbauer Spectroscopy of Locally Inhomogeneous Systems* (Almaty: OPNI IYaF NYaTs RK, 2000) 431 pp. Bibliography: 486 refs. ISBN 9965-9111-2-6.

This monograph presents a systematic review, within a unified physical and methodological framework, of the Mössbauer spectroscopy of a broad class of locally inhomogeneous systems of both scientific and applied interest. It also examines the development and software support of Mössbauer data processing and analysis methods. The book covers methodological aspects of the processing and analysis of Mössbauer data and describes MSTools — the universal software complex developed by the author, which incorporates practically all major methods available for the processing and analysis of Mössbauer spectra and which also yields most of the calculated spectral parameters as well as their temporal, field, and temperature variations. Also presented is up-to-date experimental information on topics such as atomic, crystalline, magnetic, and electronic structure of materials; the hyperfine interaction mechanisms and their correlation with local characteristics; the structural, charge, and spin states of Mössbauer atoms in nonequivalent positions in the systems under study, and processes that take place in locally inhomogeneous systems subject to thermal annealing, laser annealing, deuteration, ion implantation, static pressures, and superhigh shock pressures. Intended for researchers engaged in both the fundamental problems of solid-state physics, namely, effects of the local structure of substances on their macroscopic behavior as well as mechanisms of hyperfine interactions, and its applied aspects directed to the search and creation of new materials with predetermined properties.

Avakyan S V, Il'in R N, Lavrov V M, Ogurtsov G N *Ionization and UV Excitation Cross Sections for Electron, Ion, and Photon Collisions with Atmospheric Atoms and Molecules* A Handbook (St. Petersburg: GOI Publ., 2000) 365 pp. Bibliography: 403 refs. ISBN 90-5699-147-7. RFBR project 98-02-30071.

This handbook focuses on inelastic interactions with various component species of planetary atmospheres, involving the atoms O, N, H, He, and Ar, and the molecules H_2, N_2, O_2, H_2O, CO, CO_2, HCl, NH_3, SO_2, CH_4, and some other hydrocarbons. It covers the entire range of cosmic (including magnetospheric) particles that ionize and excite planetary atmospheres: photons, electrons, protons, and helium and hydrogen ions. The particle energy ranges covered in this book are chosen based on the actual energy spectra of cosmic fluxes, i.e. from the threshold energy for a given process up to about 1 MeV. The reference material includes data on the total, differential, and partial cross sections for ionization processes and for excitation and emission in the VUV range. Methodological aspects of the field are briefly discussed as well. The handbook is an enlarged and augmented edition of the book by the same authors entitled Avakyan S V, Il'in R N, Lavrov V M, Ogurtsov G N *Collision Processes and Excitation of UV Emission from Planetary Atmospheric Gases: A Handbook of Cross Sections* (Ed. S V Avakyan) (London: Gordon and Breach, 1998) 344 pp. For specialists in plasma physics, geophysics, astronomy, planetary science, aeronomy, ionospheric physics, spectroscopy, the physics of atomic collisions, and space technology.

Askadskiĭ A A, Kondrashchenko V I *Computerized Materials Science of Polymers* Vol. 1. ***Atomic and Molecular Levels*** (Moscow: Nauchnyĭ Mir, 1999) 544 pp. Bibliography: 224 refs. ISBN 5-89176-077-0. RFBR project 98-03-46001.
This monograph highlights a fresh approach to the quantitative analysis of how a chemical structure affects the properties of linear and cross-linked polymers. In this approach, the repeating polymer link is presented as a set of anharmonic oscillators accounting for the thermal motion of atoms under the action of intra- and intermolecular forces, including weak dispersion forces, dipole – dipole interactions, and hydrogen and chemical bonds. The book covers computer programs using this approach, which allow calculation of more than 50 fundamental physical and chemical constants for linear and cross-linked polymers and for low-molecular organic liquids. The programs solve both direct problems, i.e. yield quantitative estimates of the physical properties of a polymer, based on its chemical structure, and the inverse problem, i.e. provide computer-synthesized polymers with prescribed physical properties. For chemists, physical chemists, researchers, and undergraduate and post-graduate students. (Nauchnyĭ Mir Publ. regular mail address: 119890 Moscow, ul. Znamenka 11/11; e-mail: naumir@ben.irex.ru)

Compiled by *E V Zakharova*