

New books on physics and related sciences

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Ion-Beam Materials Processing in Micro- and Nanoelectronics (Proceedings of the RAS PTI, Vol. 15, Exec. ed. Yu P Maishev) (Moscow: Fizmatlit, 1999) 192 pp. ISBN 5-02-015315-X.

This collection is concerned with basic physical processes involved in the ion-beam and photon processing of semiconductor materials used in micro- and nanoelectronics. It discusses the physical principles which govern the formation of ion beams of chemically active gases in ion sources and on which the design of large-aperture excimer lamps for producing intense, incoherent vacuum UV depends. The book presents methods for diagnosing semiconductor and dielectric structures in micro- and nanoelectronics and evaluates the development of methods and ion sources for ion beam processing. Optical-absorption and luminescent-emission spectrometry techniques and holoellipsometry diagnostic methods for materials and structures used in micro- and nanoelectronics are also covered. The book is intended for undergraduate and post-graduate students and specialists engaged in micro- and nanoelectronics and interested in the physical fundamentals of ion technologies and how ions and photons interact with surfaces. (RAN Fiziko-Matematicheskaya Literatura Publ. regular mail address: 117071 Moscow V-71, Leninskii prospekt 15)

Bleikher G A, Krivobokov V P, Pashchenko O V *Heat and Mass Transfer in a Solid Exposed to a High-Energy Charged Particle Beam* (Novosibirsk: Nauka, 1999) 176 pp. Bibliography: 177 refs. ISBN 5-02-031536-2.

This is a systematic presentation of the method the authors developed for computer simulation of (1) thermal mechanisms by which accelerated electrons and ions in a solid dissipate their energy, and (2) phase transformation and atomic transport processes in a solid exposed to high-power micro- and macrosecond beams of charged particles. In addition to exposure risk assessment and parameter optimization of pulsed technological accelerator facilities, the method predicts the space-time evolution of temperature and thermo-mechanical stress fields, calculates phase interface movement, and determines surface erosion processes. The book examines the enhancement of atomic migration mechanisms for an intensely irradiated condensed phase and discusses some technological possibilities offered by powerful micro- and nanosecond beams of charged particles. For specialists in the radiation physics of solids and for those working with pulsed charged-particle accelerators. (RAS Siberian Branch Nauka Publ. regular mail address: 630099 Novosibirsk, ul. Sovetskaya 18)

Korotkov A S *Microelectronic Analogue Filters Using Impedance Transducers* (St. Petersburg: Nauka, 1999) 416 pp. Bibliography: 448 refs. ISBN 5-02-024899-1.

This book examines methods currently available for synthesizing the main classes of high-order analogue microelectronic filters: active, on switched capacitors, and transconductive amplifier types. It offers methods for analyzing noise and nonlinear distortions in such circuit classes. Practical examples and computer simulation results are given to illustrate the basic filter construction stages. For students, post-graduate students, college and university teachers, engineers, and research workers specializing in radio electronics and communications design. (St. Petersburg RAS Nauka Publ. regular mail address: 199034 St. Petersburg, Mendeleevskaya lin. 1)

Barvinok V A, Bogdanovich V I *Physical Principles and Mathematical Modelling of Vacuum Ion-Plasma Deposition Processes* (Moscow: Mashinostroenie, 1999) 309 pp. Bibliography: 110 refs. ISBN 5-217-02957-9.

The book discusses the physical principles behind, and mathematical modelling of, processes involved in vacuum ion-plasma deposition technologies. The major emphasis is put on three processes: the transportation of metal plasmas in rarefied gas media; electrical exchange between a moving plasma and a solid surface, and the kinetics of heterogeneous plasmochemical coating synthesis using accelerated plasma flows. Based on a new approach to the physics involved, the authors explain the low-temperature synthesis of superhard compounds on a solid surface. The book revises classical methods for calculating macroscopic chemisorption, dissociation, and desorption rates and includes much material on the actual use of deposition technologies in industry. The monograph is intended for students, post-graduate students, college and university teachers, engineers, and research workers interested in deposition techniques and heterogeneous synthesis, and how plasma interacts with a solid surface. (Mashinostroenie Publ. regular mail address: 107076 Moscow, Stromynskii per. 4)

Thermophysical Studies Collection of papers dedicated to the 80th birthday of Academician V I Subbotin (Ed. by A D Efanov and F A Kozlov) (Obninsk: GNTs RF FÉI Publ., 1999) 284 pp.

This collection commemorates the 80th birthday of Academician V I Subbotin. Topics addressed include the thermal hydraulics of nuclear power plants; the physics and chemistry of liquid-metal heat transfer equipment, and performance parameter measurements. The book discusses the historical background of the field and covers the latest FÉI advances in thermophysical research. (RF State Scientific Center — A I Leipunskii Physics and Energy Institute: 249020 Kaluga region, Obninsk, pl/ Bondarenko 1)

Sorokin Yu M, Shiryaev V S *Optical Losses in Fibers* (N Novgorod: NNGU Publ., 2000) 324 pp. Bibliography: 220 refs. ISBN 5-85746-306-8.

This monograph examines optical loss mechanisms operating in passive dielectric optical fibers and how these losses can be measured. It covers the existing types of such light guides,

methods of their fabrication, and the fundamentals of their optics. Special emphasis is placed on the spectrum of losses which are interpreted in this context as determined by the superposition of various mechanisms in a manner dependent on physical and chemical properties of the light guide material. On this basis, the lower limit on the optical losses is estimated for various optical fiber types. The book presents new data on the spectral, temperature, time, and photoinduction variation of losses in chalcogenide-based light guides. The authors briefly describe the physical principles of operation of active light guides and fiber lattices, discuss their properties, and examine the principles governing the use of such systems in multichannel networks. They also cover the main types of fiber connections, loss mechanisms in them, and their potential for optical line assembly applications. Special attention is given to instruments and methods for the laboratory measurement of the optical properties of high-purity glasses and chalcogenide-based light guides in the mid-IR range. Coverage also includes the apparatus and technologies for field measurements on fiber-optic communication lines using quartz optical fibers — the type currently holding a monopoly in the field. In connection with the dispersion properties of such light guides, possibilities for the organization of information channels in them are indicated. The material of the book is selected and organized in textbook format, suitable for students in physics disciplines specializing in fiber-optic communication. (Nizhniĭ Novgorod N I Lobachevsky State University Publ. regular mail address: 603600 Nizhniĭ Novgorod, prosp. Gagarina 23)

XVI Meeting on Neutron Scattering Techniques in Condensed Matter Studies. Program and Abstracts (Ed. by V L Aksenov, A V Belushkin, A V Puchkov, V V Savostin) (Obninsk: GNTs RF FĖI Publ., 1999) 158 pp.

This collection presents the program and abstracts of papers from the XVI Meeting on the use of neutron scattering in the study of condensed matter, held in Obninsk on 13–17 September 1999. The scientific program of the meeting includes crystal structures and excitations in crystals; magnetism and strongly correlated electron systems; noncrystalline materials and liquids; materials science and applied studies, and methods and instrumentation of neutron-based experiments. (RF State Scientific Center — A I Leipunskii Physics and Energy Institute: 249020 Kaluga region, Obninsk, pl. Bondarenko 1; tel. (7-08439) 98368; <http://www.ippe.rssi.ru/departament/Ins>)

Proceedings of the Third Conference on Radiophysics (May 7, 1999, Nizhniĭ Novgorod) (Ed. by A V Yakimov) (Nizhniĭ Novgorod: NNGU Publ, 1999) 296 pp.

This is a collection of papers presented at a scientific conference organized by the Nizhniĭ Novgorod State University Physics Department. The papers encompass major research activities in which Department chairs, NNSU faculty members, students, masters, and post-graduate students, and also researchers from other radiophysics institutions are involved. The edition is part of the special-purpose federal Integration Program (Education and Science Centre ‘Fundamental radiophysics’, Section 1.6 ‘Restoration of scientific olympiads, contests, and scientific schools and conferences for the youth’). An electronic version of the collection is available at <http://rf.unn.runnet.ru/rus/sci/books/> (Nizhniĭ Novgorod State University Publ. regular mail address: 603600 Nizhniĭ Novgorod, prosp. Gagarina 23)

Semenov S M, Kunina I M, Kukhta B A *Tropospheric Ozone and Plant Growth in Europe* (Moscow: Meteorologiya and Gidrologiya Publishing Center, 1999) 208 pp. Bibliography: 410 refs. ISBN 5-7699-0009-1.

This monograph discusses the fundamentals of interactions between plants and the atmosphere. The authors examine how changes in the anthropogenic emission of the chemical precursors of ozone affect its concentration in the troposphere and how changes in ozone concentration influence the productivity of ground plants. The book analyzes O₃ fields in the lower atmosphere, discusses how they form and how various sources contribute to their formation, and considers anthropogenic variations involved. Special attention is given to mechanisms by which ozone affects higher plants, biochemical and physiological phenomena, and the growth process. The authors present action–response curves for the influence of O₃ (and also of SO₂ and CO₂) on the productivity of higher plants and calculate the amount by which the biomass of trees and the yield of agricultural crops in Europe are reduced due to the anthropogenic increase in the concentration of O₃ and SO₂ in the 20th century. Based on the approach developed by the authors, the problem of the critical ozone load on ground plants is treated. The research covered in the books was supported by RFBR grants Nos 98-05-64599 and 98-05-64600 and by the state science and technology program ‘Global Climate and Environmental Changes’ led by Academician N P Laverov. The book is for those engaged in the physics and chemistry of the atmosphere and interested in ecology and geography. (Meteorologiya and Gidrologiya Publishing Center regular mail address: 123242 Moscow, Novovagan’kovskii per. 12)

Nonlinear Dynamics and Control. On the 70th Birthday of Academician S V Emel’yanov Collection of ISA RAN studies. (Compiled by S K Korovin) (Moscow: Ėditorial URSS, 1999) 288 pp. ISBN 5-901006-88-7.

Included in the scope of this book, devoted to RAS Academician Stanislav Vasil’evich Emel’yanov, are the research areas to which he most actively contributed. A selective index of S V Emel’yanov’s works is given at the end of the book. (Ėditorial URSS Publ. contact information: tel./fax (7-095) 135-4423, tel. (7-095) 135-4246; urss@urss.isa.ac.ru)

The First Accelerator in Dubna: On the 50th Anniversary of the JINR Synchrocyclotron. Pages of History in Illustrations and Recollections (Comp. by Yu A Batusov, N S Kavalerova, E E Molchanov; General Editor N A Rusakovich) (JINR, 99-304) (Dubna: OIYaI Publ., 1999) 128 pp. ISBN 5-85165-547-X.

The Laboratory of Nuclear Problems is the oldest laboratory in the JINR, Dubna. Its very foundation, the internationally recognized achievements of its members, and the vast experience they have gathered in nuclear physics, condensed matter physics, and high-energy particle physics — all this is inextricably linked to the Dubna synchrocyclotron, its launch 50 years ago and its successful work since then. The articles by laboratory veterans cover the history of the creation and work of the synchrocyclotron, Dubna’s first accelerator. The book is illustrated with photographs depicting the 50 years of the Lab’s history. (OIYaI Publ. regular mail address: 141980 Dubna, Moscow region, ul. Joliot-Curie 6)

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