



Physics Of Laser Crystals

David H. Titterton



Physics Of Laser Crystals:

Physics of Laser Crystals Jean-Claude Krupa, Nicolay A. Kulagin, 2003-11-30 Physics of laser crystals has been constantly developing since the invention of the laser in 1960 Nowadays more than 1500 wide band gap and semiconductors crystals are suitable for the production of the laser effect Different laser devices are widely used in science medicine and communication systems according to the progress achieved in the development of laser crystal physics Scintillators for radiation detection also gained benefit from these developments Most of the optically active materials offer laser radiations within the 500 to 3000 nm region with various quantum efficiency which fit the usual applications However new crystals for laser emissions are needed either in the blue UV and VUV region or far IR region especially for medicine computer microchip production and for undiscovered practical uses Scientific problems of the growth and properties of laser crystals are discussed in numerous books and scientific journals by many scientists working in the field Therefore we thought that joint discussions of the scientific and technical problems in laser physics will be useful for further developments in this area We have proposed to held a Workshop on Physics of Laser Crystals for attempting to induce additional advances especially in solid state spectroscopy This NATO Advanced Research Workshop ARW was hold in Kharkiv Stary Saltov th nd Ukraine on august 26 September 2 2002 and was mainly devoted to the consideration 0 f modem approaches and last results in physics of laser crystals

Laser Crystals A. A. Kaminskii, 2013-12-19 The greatest reward for an author is the feeling of satisfaction he gets when it becomes clear to him that readers find his work useful After my book appeared in the USSR in 1975 I received many letters from fellow physicists including colleagues from Western European countries and the USA Some of those letters as well as official reviews of the book made specific sug gestions for improving the book The satisfaction I derived from all those kind and warm responses gave me the determination to continue work on the book in order to fulfill these wishes in the next edition This possibility arose when one of the scientific editors from Springer Verlag Heidelberg H Latsch who is the founder of the well known series of quasi monographs Topics in Applied Physics visited our Institute and suggested an English edition of my book For all this and for his subsequent help I am sincerely thankful I consider it my pleasant duty also to express my gratitude to the American physicist H F Ivey who served as scientific editor of the trans lation The English version of the book retains the structure of the Russian edition though it is supplemented with many new data in the tables and figures It reflects trends in the development of the physics and spectroscopy of laser crystals in recent years

Laser Crystals Alexander A. Kaminskii, 2013-06-29 It was a greatest pleasure for me to learn that Springer Verlag wished to produce a second edition of my book In this connection Dr H Lotsch asked me to send him a list of misprints mistakes and inaccuracies that had been noticed in the first edition and to make corresponding corrections without disturbing the layout or the typo graphy too much I accepted this opportunity with alacrity and moreover found some free places in the text where I was able to insert some concise up to date information about new lasing compounds and stimulated

emission channels It was also possible to increase the number of reference citations The reader of the second edition hence has access to more complete data on insulating laser crystals However sections on laser crystal physics have not been updated because a satisfactory description of the progress made in the last ten years in this field would have required the sections to be extended enormously or even a new book to be written Moscow July 1989 ALEXANDER A KAMINSKII Preface to the First Edition The greatest reward for an author is the feeling of satisfaction he gets when it becomes clear to him that readers find his work useful After my book appeared in the USSR in 1975 I received many letters from fellow physicists including colleagues from Western European countries and the USA

Crystalline Lasers Alexander Kaminskii, 2020-09-10

By the end of the 1970s crystalline lasers were widely used in science engineering medicine and technology The types of lasers used have continued to grow in number to include newly discovered crystalline hosts previously known compounds generating at other spectral wavelengths and broadband tunable stimulated emission This has led to the creation of an extremely promising new generation of crystalline lasers that are both highly efficient and more reliable The major part of this book is devoted to describing multilevel operating laser schemes for stimulated emission excitation in insulating crystals doped with lanthanide ions The first part of Crystalline Lasers deals with the history of the physics and spectroscopy of insulating laser crystals The chapters in the second part of the book present results from the study of Stark energy levels of generating ions in laser crystals and their radiative and nonradiative intermanifold transition characteristics This section includes extensive tabular data and reference information Popular and novel operating schemes of crystalline lasers are covered in Part 3 In the chapters in the fourth part of the book the newest technologies in the physics and engineering of crystalline lasers are considered The results of investigations into laser action under selective excitations miniature crystalline lasers and the properties of nonlinear activated laser crystals are presented and analyzed Crystalline Lasers summarizes and reviews the results of many years of research and studies of activator ions and multilevel operating laser schemes and discusses exciting prospects of using these systems to create new types of crystalline lasers This book will be of use to laser scientists and engineers physicists and chemical engineers

Laser Crystals Aleksandr Aleksandrovich Kaminskiĭ, 1981 The greatest reward for an author is the feeling of satisfaction he gets when it becomes clear to him that readers find his work useful After my book appeared in the USSR in 1975 I received many letters from fellow physicists including colleagues from Western European countries and the USA Some of those letters as well as official reviews of the book made specific suggestions for improving the book The satisfaction I derived from all those kind and warm responses gave me the determination to continue work on the book in order to fulfill these wishes in the next edition This possibility arose when one of the scientific editors from Springer Verlag Heidelberg H Latsch who is the founder of the well known series of quasi monographs Topics in Applied Physics visited our Institute and suggested an English edition of my book For all this and for his subsequent help I am sincerely thankful I consider it my pleasant duty also to express my gratitude to the

American physicist H F Ivey who served as scientific editor of the translation The English version of the book retains the structure of the Russian edition though it is supplemented with many new data in the tables and figures It reflects trends in the development of the physics and spectroscopy of laser crystals in recent years *Crystalline Lasers* Alexander Kaminskii, 2020-09-10 By the end of the 1970s crystalline lasers were widely used in science engineering medicine and technology The types of lasers used have continued to grow in number to include newly discovered crystalline hosts previously known compounds generating at other spectral wavelengths and broadband tunable stimulated emission This has led to the creation of an extremely promising new generation of crystalline lasers that are both highly efficient and more reliable The major part of this book is devoted to describing multilevel operating laser schemes for stimulated emission excitation in insulating crystals doped with lanthanide ions The first part of Crystalline Lasers deals with the history of the physics and spectroscopy of insulating laser crystals The chapters in the second part of the book present results from the study of Stark energy levels of generating ions in laser crystals and their radiative and nonradiative intermanifold transition characteristics This section includes extensive tabular data and reference information Popular and novel operating schemes of crystalline lasers are covered in Part 3 In the chapters in the fourth part of the book the newest technologies in the physics and engineering of crystalline lasers are considered The results of investigations into laser action under selective excitations miniature crystalline lasers and the properties of nonlinear activated laser crystals are presented and analyzed Crystalline Lasers summarizes and reviews the results of many years of research and studies of activator ions and multilevel operating laser schemes and discusses exciting prospects of using these systems to create new types of crystalline lasers This book will be of use to laser scientists and engineers physicists and chemical engineers **Crystalline Lasers** Aleksandr Aleksandrovich Kaminskiĭ, 1996 By the end of the 1970s crystalline lasers were widely used in science engineering medicine and technology The types of lasers used have continued to grow in number to include newly discovered crystalline hosts previously known compounds generating at other spectral wavelengths and broadband tunable stimulated emission This has led to the creation of an extremely promising new generation of crystalline lasers that are both highly efficient and more reliable The major part of this book is devoted to describing multilevel operating laser schemes for stimulated emission excitation in insulating crystals doped with lanthanide ions The first part of Crystalline Lasers deals with the history of the physics and spectroscopy of insulating laser crystals The chapters in the second part of the book present results from the study of Stark energy levels of generating ions in laser crystals and their radiative and nonradiative intermanifold transition characteristics This section includes extensive tabular data and reference information Popular and novel operating schemes of crystalline lasers are covered in Part 3 In the chapters in the fourth part of the book the newest technologies in the physics and engineering of crystalline lasers are considered The results of investigations into laser action under selective excitations miniature crystalline lasers and the properties of nonlinear activated laser crystals are presented and analyzed Crystalline

Lasers summarizes and reviews the results of many years of research and studies of activator ions and multilevel operating laser schemes and discusses exciting prospects of using these systems to create new types of crystalline lasers This book will be of use to laser scientists and engineers physicists and chemical engineers **The Physics and Engineering of Solid State Lasers** Yehoshua Y. Kalisky, 2006 This text explains the mutual influences between the physical and dynamic processes in solids and their lasing properties It provides insight into the physics and engineering of solid state lasers by integrating information from several disciplines including solid state physics materials science photophysics and dynamic processes in solids The text discusses approaches to developing new laser materials and includes data tables of basic parameters that can be applied to laser design Novel materials and techniques used in recent developments are also covered **Photonic Crystals** Alessandro Massaro, 2012-03-30 The second volume of the book concerns the characterization approach of photonic crystals photonic crystal lasers photonic crystal waveguides and plasmonics including the introduction of innovative systems and materials Photonic crystal materials promises to enable all optical computer circuits and could also be used to make ultra low power light sources Researchers have studied lasers from microscopic cavities in photonic crystals that act as reflectors to intensify the collisions between photons and atoms that lead to lasing but these lasers have been optically pumped meaning they are driven by other lasers Moreover the physical principles behind the phenomenon of slow light in photonic crystal waveguides as well as their practical limitations are discussed This includes the nature of slow light propagation its bandwidth limitation coupling of modes and particular kind terminating photonic crystals with metal surfaces allowing to propagate in surface plasmon polariton waves The goal of the second volume is to provide an overview about the listed issues

Investigation of Crystal Imperfections by Means of Laser Light Scattering Richard Conger Powell, 1967 The use of light scattering as a method for studying imperfections in crystals is discussed A unique apparatus using a laser as a light source for ultramicroscopy and angular scattering experiments is described The results obtained utilizing this apparatus for investigations of imperfections in ruby crystals are presented and discussed These investigations were done as a function of crystal growth direction annealing boule morphology polarization chromium concentration gamma irradiation and temperature The results of this work demonstrate the usefulness of this new equipment as a convenient nondestructive technique for characterizing imperfections in crystals of relatively large size They also indicate the existence of both randomly distributed scatterers and oriented scattering regions in ruby crystals and show how these scattering centers are altered by changes in the various parameters studied in this investigation Author **CRC Handbook of Laser Science and Technology Supplement 2** Marvin J. Weber, 1994-12-28 In the CRC Handbook of Laser Science and Technology Supplement 2 experts summarize the discovery and properties of new optical materials that have appeared since the publication of Volumes III V Included are the latest advances in optical crystals glasses and plastics laser host materials phase conjugation materials linear electrooptic materials nonlinear optical materials magnetooptic materials elastooptic

materials photorefractive materials liquid crystals and thin film coatings The book also includes expanded coverage of optical waveguide materials and new sections on optical liquids glass fiber lasers diamond optics and gradient index materials Appendices include Designation of Russian Optical Glasses Abbreviations Acronyms and Mineralogical or Common Names for Optical Materials and Abbreviations for Methods of Preparing Optical Materials Extensive tabulations of materials properties with references to the primary literature are provided throughout the supplement The CRC Handbook of Laser Science and Technology Supplement 2 represents the latest volume in the most comprehensive up to date listing of the properties of optical materials for lasers and laser systems making it an essential reference work for all scientists and engineers working in laser research and development

Physics of Solid-State Laser Materials Zundu Luo,Yidong Huang,2020-04-07 This book discusses the spectral properties of solid state laser materials including emission and absorption of light the law of radiative and nonradiative transitions the selection rule for optical transitions and different calculation methods of the spectral parameters The book includes a systematic presentation of the authors own research works in this field specifically addressing the stimulated nonradiative transition theory and the apparent crystal field model This volume is helpful resource for researchers and graduate students in the fields of solid spectroscopy and solid state laser material physics while also serving as a valuable reference guide for instructors and advanced students of physics

Liquid Crystals Scott J. Woltman,Gregory Philip Crawford,Gregory D. Jay,2007 The confluence of the fields of liquid crystals and biomedical engineering is resulting in remarkable interdisciplinary research This book focuses on the potential for inherently translational research in one field of engineering to radically alter the scope of another The text reviews the exciting advances being made in displays spectroscopy sensors and diagnostics biomimicking actuators and lasers with regards to liquid crystalline materials and biomedicine The liquid crystal field which has delivered revolutionary devices in the display optics and telecommunications industries is now poised to make significant inroads into biology medicine and biomedical engineering

Military Laser Technology and Systems David H. Titterton,2015-03-01 This new resource provides an insight into the physical principles of the device technology that underpins many laser based military systems in one form or another From this knowledge a deeper understanding of the fundamental requirements and the potential performance as well as limitations of such systems may be assessed given the appropriate operational parameters Engineers and students are provided with practical advice on how to evaluate laser devices and systems operate them safely and train with them

Semiconductor Lasers Alexei Baranov,Eric Tournié,2013-04-23 Semiconductor lasers have important applications in numerous fields including engineering biology chemistry and medicine They form the backbone of the optical telecommunications infrastructure supporting the internet and are used in information storage devices bar code scanners laser printers and many other everyday products Semiconductor lasers Fundamentals and applications is a comprehensive review of this vital technology Part one introduces the fundamentals of semiconductor lasers beginning with key principles

before going on to discuss photonic crystal lasers high power semiconductor lasers and laser beams and the use of semiconductor lasers in ultrafast pulse generation Part two then reviews applications of visible and near infrared emitting lasers Nonpolar and semipolar GaN based lasers advanced self assembled InAs quantum dot lasers and vertical cavity surface emitting lasers are all considered in addition to semiconductor disk and hybrid silicon lasers Finally applications of mid and far infrared emitting lasers are the focus of part three Topics covered include GaSb based type I quantum well diode lasers interband cascade and terahertz quantum cascade lasers whispering gallery mode lasers and tunable mid infrared laser absorption spectroscopy With its distinguished editors and international team of expert contributors Semiconductor lasers is a valuable guide for all those involved in the design operation and application of these important lasers including laser and telecommunications engineers scientists working in biology and chemistry medical practitioners and academics working in this field Provides a comprehensive review of semiconductor lasers and their applications in engineering biology chemistry and medicine Discusses photonic crystal lasers high power semiconductor lasers and laser beams and the use of semiconductor lasers in ultrafast pulse generation Reviews applications of visible and near infrared emitting lasers and mid and far infrared emitting lasers

Beam Acceleration In Crystals And Nanostructures - Proceedings Of The Workshop
 Swapan Chattopadhyay, Gerard Mourou, Vladimir D Shiltsev, Toshiki Tajima, 2020-02-18 Recent advancements in generation of intense X ray laser ultrashort pulses open opportunities for particle acceleration in solid state plasmas Wakefield acceleration in crystals or carbon nanotubes shows promise of unmatched ultra high accelerating gradients and possibility to shape the future of high energy physics colliders This book summarizes the discussions of the Workshop on Beam Acceleration in Crystals and Nanostructures Fermilab June 24 25 2019 presents next steps in theory and modeling and outlines major physics and technology challenges toward proof of principle demonstration experiments

Laser-Induced Damage in Optical Materials Detlev Ristau, 2014-12-03 Dedicated to users and developers of high powered systems Laser Induced Damage in Optical Materials focuses on the research field of laser induced damage and explores the significant and steady growth of applications for high power lasers in the academic industrial and military arenas Written by renowned experts in the field this book concentrates on the major topics of laser induced damage in optical materials and most specifically addresses research in laser damage that occurs in the bulk and on the surface or the coating of optical components It considers key issues in the field of high power laser coatings factoring in the effects of contamination and providing insight into typical application areas Become Familiar with the Key Areas of Modern Photonics The text first provides a basic understanding of theoretical and experimental methods and then summarizes the current progress strategies and improvements occurring within the field of laser induced damage Divided into four sections this book outlines apparent trends in modeling and discusses measurement and evaluation techniques for laser damage thresholds in the context of international standardization and scaling laws for damage thresholds This seminal work Covers the major aspects of laser

damage Considers all important aspects in industry and research Reviews laser damage effects in material and surfaces Contains chapters contributed by leading scientists in the field Laser Induced Damage in Optical Materials details a variety of fundamental investigations in laser induced damage mechanisms and functions as a valuable reference for researchers and producers of laser components laser and photonics engineers and scientists as well as users of laser technology and thin film optics

The Laser Literature Kiyo Tomiyasu,2013-11-09 Handbook of Solid-State Lasers B Denker,E Shklovsky,2013-02-20 Solid state lasers which offer multiple desirable qualities including enhanced reliability robustness efficiency and wavelength diversity are absolutely indispensable for many applications The Handbook of solid state lasers reviews the key materials processes and applications of solid state lasers across a wide range of fields Part one begins by reviewing solid state laser materials Fluoride laser crystals oxide laser ceramics crystals and fluoride laser ceramics doped by rare earth and transition metal ions are discussed alongside neodymium erbium and ytterbium laser glasses and nonlinear crystals for solid state lasers Part two then goes on to explore solid state laser systems and their applications beginning with a discussion of the principles powering and operation regimes for solid state lasers The use of neodymium doped materials is considered followed by system sizing issues with diode pumped quasi three level materials erbium glass lasers and microchip fiber Raman and cryogenic lasers Laser mid infrared systems laser induced breakdown spectroscopy and the clinical applications of surgical solid state lasers are also explored The use of solid state lasers in defense programs is then reviewed before the book concludes by presenting some environmental applications of solid state lasers With its distinguished editors and international team of expert contributors the Handbook of solid state lasers is an authoritative guide for all those involved in the design and application of this technology including laser and materials scientists and engineers medical and military professionals environmental researchers and academics working in this field Reviews the materials used in solid state lasers Explores the principles of solid state laser systems and their applications Considers defence and environmental applications

High-Power Lasers and Laser Plasmas / Moshchnye Lazery I Lazernaya Plazma / Мощные Лазеры И Лазерная Плазма N. G. Basov,2012-12-06

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