

Springer Series in
Optical Sciences

Alexander A. Kaminskii

Laser Crystals



Springer-Verlag Berlin Heidelberg New York

Laser Crystals Their Physics And Properties

**Ferenc Krausz, Georg Korn, Paul
Corkum, Ian A Walmsley**



Laser Crystals Their Physics And Properties:

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 typography 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

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 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

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

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 held in Kharkiv Sary Saltov th nd Ukraine on August 26 September 2 2002 and was mainly devoted to the consideration of modern approaches and latest results in physics of laser crystals

Handbook of Laser Technology and Applications Colin Webb, Julian D.C. Jones, 2020-09-29 The invention of the laser was one of the towering achievements of the twentieth century At the opening of the twenty first century we are witnessing the burgeoning of the myriad technical innovations to which that invention has led The Handbook of Laser Technology and Applications is a practical and long lasting reference source for scientists and engineers who work with lasers The Handbook provides a comprehensive guide to the current status of lasers and laser systems it is accessible to science or engineering graduates needing no more than standard undergraduate knowledge of optics Whilst being a self contained reference work the Handbook provides extensive references to contemporary work and is a basis for studying the professional journal literature on the subject It covers applications through detailed case studies and is therefore well suited to readers who wish to use it to solve specific problems of their own The first of the three volumes comprises an introduction to the basic scientific principles of lasers laser beams and non linear optics The second volume describes the mechanisms and operating characteristics of specific types of laser including crystalline solid state lasers semiconductor diode lasers fibre lasers gas lasers chemical lasers dye lasers and many others as well as detailing the optical and electronic components which tailor the laser's performance and beam delivery systems The third volume is devoted to case studies of applications in a wide range of subjects including materials processing optical measurement techniques medicine telecommunications data storage spectroscopy earth sciences and astronomy and plasma fusion research This vast compendium of knowledge on laser science and technology is the work of over 130 international experts many of whom are recognised as the world leaders in their respective fields Whether the reader is engaged in the science technology industrial or medical applications of lasers or is researching the subject as a manager or investor in technical enterprises they cannot fail to be informed and enlightened by the wide range of information the Handbook supplies

Handbook of Laser Technology and Applications Chunlei Guo, 2021-06-23 This comprehensive handbook gives a fully updated guide to lasers and laser systems including the complete range of their technical applications The first volume outlines the fundamental components of lasers their properties and working principles The second volume gives exhaustive coverage of all major categories of lasers from solid state and semiconductor diode to fiber waveguide gas chemical and dye lasers The third volume covers modern applications in engineering and technology including all new and updated case studies spanning telecommunications and data storage to medicine optical measurement defense and security nanomaterials processing and characterization

Handbook of Laser Technology and Applications (Three- Volume Set) Colin Webb, Julian D. C. Jones, 2003-12-01 The invention of the laser was one of the towering achievements of the twentieth century At the opening of the twenty first century we are witnessing the burgeoning of the myriad technical innovations to

which that invention has led The Handbook of Laser Technology and Applications is a practical and long lasting reference source for scientists a **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 **Lasers for Medical Applications** Helena Jelínková,2013-09-30 Lasers have a wide and growing range of applications in medicine Lasers for Medical Applications summarises the wealth of recent research on the principles technologies and application of lasers in diagnostics therapy and surgery Part one gives an overview of the use of lasers in medicine key principles of lasers and radiation interactions with tissue To understand the wide diversity and therefore the large possible choice of these devices for a specific diagnosis or treatment the respective types of the laser solid state gas dye and semiconductor are reviewed in part two Part three describes diagnostic laser methods for example optical coherence tomography spectroscopy optical biopsy and time resolved fluorescence polarization spectroscopy Those methods help doctors to refine the scope of involvement of the particular body part or for example to specify the extent of a tumor Part four concentrates on the therapeutic applications of laser radiation in particular branches of medicine including ophthalmology dermatology cardiology urology gynecology otorhinolaryngology ORL neurology dentistry orthopaedic surgery and cancer therapy as well as laser coatings of implants The final chapter includes the safety precautions with which the staff working with laser instruments must be familiar With its distinguished editor and international team of contributors this important book summarizes international achievements in the field of laser applications in medicine in the past 50 years It provides a valuable contribution to laser medicine by outstanding experts in medicine and engineering Describes the interaction of laser light with tissue Reviews every type of laser used in medicine solid state gas dye and semiconductor Describes the use of lasers for diagnostics **Handbook of Laser Wavelengths** Marvin J. Weber,2018-10-08 This volume represents the most complete up to date compilation of wavelengths of lasers in all media Divided by type solid liquid and gas and listed in order of increasing wavelength Handbook of Laser Wavelengths includes crystalline paramagnetic ion lasers glass lasers color center lasers semiconductor lasers polymer lasers liquid and solid state dye lasers rare earth liquid lasers neutral atom ion and molecular gas lasers extreme ultraviolet and soft X ray lasers free electron lasers nuclear pumped lasers lasers in nature lasers without inversion Brief descriptions of each type of laser are presented followed by tables listing the laser wavelength lasing element or medium host transition and primary literature citations A special section on commercial lasers is an added featured Handbook of Laser Wavelengths singularly serves as the essential reference for scientists and engineers searching for laser sources for specific applications as well as a survey of the developments that have occurred since the advent of the

laser Springer Handbook of Crystal Growth Govindhan Dhanaraj, Kullaiah Byrappa, Vishwanath Prasad, Michael Dudley, 2010-10-20 Over the years many successful attempts have been chapters in this part describe the well known processes made to describe the art and science of crystal growth such as Czochralski Kyropoulos Bridgman and o and many review articles monographs symposium v ing zone and focus speci cally on recent advances in umes and handbooks have been published to present improving these methodologies such as application of comprehensive reviews of the advances made in this magnetic elds orientation of the growth axis intro eld These publications are testament to the grow duction of a pedestal and shaped growth They also ing interest in both bulk and thin lm crystals because cover a wide range of materials from silicon and III V of their electronic optical mechanical microstructural compounds to oxides and uorides and other properties and their diverse scienti c and The third part Part C of the book focuses on technological applications Indeed most modern ad lution growth The various aspects of hydrothermal vances in semiconductor and optical devices would growth are discussed in two chapters while three other not have been possible without the development of chapters present an overview of the nonlinear and laser many elemental binary ternary and other compound crystals KTP and KDP The knowledge on the effect of crystals of varying properties and large sizes The gravity on solution growth is presented through a c literature devoted to basic understanding of growth parison of growth on Earth versus in a microgravity mechanisms defect formation and growth processes environment 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 **Luminescent Materials in Display and Biomedical Applications** Vikas Dubey, Sudipta Som, Vijay Kumar, 2020-11-18 Luminescent materials with advanced performance are in the research hot spot with the recent technical developments of the display lighting and fluorescence labeling Rare earth doped luminescent materials have been the focus of the research community owing to their wide applications in display devices temperature sensors solar cells biomedical fields optoelectronics etc This book covers the broad aspects of organic and inorganic materials based phosphors The purpose of this book is to provide an up to date account of the present status and advancement of various techniques of synthesis of luminescent materials and their advanced applications in different areas This book will cover all the experimental and theoretical approaches related to the rare earth doped luminescent materials It also contains all the necessary information about the rare earth doped luminescent materials that were used in the past few years In a nutshell this book provides a unique platform to the newcomers who are planning to do research on rare earthdoped luminescent materials as well as the researchers who are well established in this

field 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 **Ultrafast Optics IV** Ferenc Krausz,Georg Korn,Paul Corkum,Ian A Walmsley,2012-08-10 The papers in this volume cover the major areas of research activity in the field of ultrafast optics at the present time and they have been selected to provide an overview of the current state of the art The purview of the field is the methods for the generation amplification and characterization of electromagnetic pulses with durations from the pico to the attosecond range as well as the technical issues surrounding the application of these pulses in physics chemistry and biology The contributions were solicited from the participants in the Ultrafast Optics IV Conference held in Vienna Austria in June 2003 The purpose of the conference is similar to that of this book to provide a forum for the latest advances in ultrafast optical technology Ultrafast light sources provide a means to observe and manipulate events on the scale of atomic and molecular dynamics This is possible either through appropriate shaping of the time dependent electric field or through the application of fields whose strength is comparable to the binding forces of the electrons in atoms and molecules Recent advances discussed here include the generation of pulses shorter than two optical cycles and the ability to measure and to shape them in all degrees of freedom with unprecedented 2 21 2 precision and to amplify them to the Zettawatt cm 10 W cm range **Solid-State Lasers and Applications** Alphan Sennaroglu,2017-12-19 Because of the favorable characteristics of solid state lasers they have become the preferred candidates for a wide range of applications in science and technology including spectroscopy atmospheric monitoring

micromachining and precision metrology Presenting the most recent developments in the field Solid State Lasers and Applications focuses on the design and applications of solid state laser systems With contributions from leading international experts the book explores the latest research results and applications of solid state lasers as well as various laser systems The beginning chapters discuss current developments and applications of new solid state gain media in different wavelength regions including cerium doped lasers in the ultraviolet range ytterbium lasers near 1 μ m rare earth ion doped lasers in the eye safe region and tunable Cr²⁺ ZnSe lasers in the mid infrared range The remaining chapters study specific modes of operation of solid state laser systems such as pulsed microchip lasers high power neodymium lasers ultrafast solid state lasers amplification of femtosecond pulses with optical parametric amplifiers and noise characteristics of solid state lasers Solid State Lasers and Applications covers the most important aspects of the field to provide current comprehensive coverage of solid state lasers The Rare Earth Trifluorides Boris Pavlovich Sobolev,2000 **Fundamentals of Semiconductor Lasers** Takahiro Numai,2006-05-10 Fundamentals of Semiconductor Lasers explains the physics and fundamental characteristics of semiconductor lasers with regard to systems applications The detailed and comprehensive presentation is unique in that it encourages the reader to consider different semiconductor lasers from different angles Emphasis is placed on recognizing common concepts such operating principles and structure and solving problems based on individual situations The treatment is enhanced by an historical account of advances in semiconductor lasers over the years discussing both those ideas that have persisted over the years and those that have faded out The first four chapters cover the basics of semiconductors including band structures optical transitions optical waveguides and optical resonators The remaining chapters discuss operating principles and basic characteristics of semiconductor lasers and advanced topics including dynamic single mode lasers quantum well lasers and control of spontaneous emission The reader need only be familiar with undergraduate level electromagnetism and quantum mechanics After reading this book the student will be able to think critically about semiconductor lasers and be able to read and understand journal papers in the field This book will be essential to any advanced undergraduate or graduate student of semiconductor lasers and any professional physicist or engineer looking for a good overview of the subject **Handbook of Hydrothermal Technology** K. Byrappa,Masahiro Yoshimura,2012-12-31 Quartz zeolites gemstones perovskite type oxides ferrite carbon allotropes complex coordinated compounds and many more all products now being produced using hydrothermal technology Handbook of Hydrothermal Technology brings together the latest techniques in this rapidly advancing field in one exceptionally useful long needed volume The handbook provides a single source for understanding how aqueous solvents or mineralizers work under temperature and pressure to dissolve and recrystallize normally insoluble materials and decompose or recycle any waste material The result as the authors show in the book is technologically the most efficient method in crystal growth materials processing and waste treatment The book gives scientists and technologists an overview of the entire subject including

Evolution of the technology from geology to widespread industrial use Descriptions of equipment used in the process and how it works Problems involved with the growth of crystals processing of technological materials environmental and safety issues Analysis of the direction of today s technology In addition readers get a close look at the hydrothermal synthesis of zeolites fluorides sulfides tungstates and molybdates as well as native elements and simple oxides Delving into the commercial production of various types the authors clarify the effects of temperature pressure solvents and various other chemical components on the hydrothermal processes Gives an overview of the evolution of Hydrothermal Technology from geology to widespread industrial use Describes the equipment used in the process and how it works Discusses problems involved with the growth of crystals processing of technological materials and environmental and safety issues

Laser Crystals Their Physics And Properties Book Review: Unveiling the Power of Words

In a global driven by information and connectivity, the power of words has be evident than ever. They have the capability to inspire, provoke, and ignite change. Such may be the essence of the book **Laser Crystals Their Physics And Properties**, a literary masterpiece that delves deep into the significance of words and their affect our lives. Published by a renowned author, this captivating work takes readers on a transformative journey, unraveling the secrets and potential behind every word. In this review, we shall explore the book is key themes, examine its writing style, and analyze its overall effect on readers.

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