



Handbook of solid-state lasers

Materials, systems and
applications

Edited by B. Denker and E. Shklovsky

**Handbook Of Solid State Lasers Materials Systems And
Applications Woodhead Publishing Series In Electronic
And Optical Materials**

M Walker



Handbook Of Solid State Lasers Materials Systems And Applications Woodhead Publishing Series In Electronic And Optical Materials:

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 [Handbook of Organic Materials for Optical and \(Opto\)Electronic Devices](#) Oksana Ostroverkhova, 2013-08-31 Small molecules and conjugated polymers the two main types of organic materials used for optoelectronic and photonic devices can be used in a number of applications including organic light emitting diodes photovoltaic devices photorefractive devices and waveguides Organic materials are attractive due to their low cost the possibility of their deposition from solution onto large area substrates and the ability to tailor their properties The Handbook of organic materials for optical and optoelectronic devices provides an overview of the properties of organic optoelectronic and nonlinear optical materials and explains how these materials can be used across a range of applications Parts one and two explore the materials used for organic optoelectronics and nonlinear optics their properties and methods of their characterization illustrated by physical studies Part three moves on to discuss the applications of optoelectronic and nonlinear optical organic materials in devices and includes chapters on organic solar cells electronic memory devices and electronic chemical sensors electro optic devices The Handbook of organic materials for optical and optoelectronic devices is a technical resource for physicists chemists electrical engineers and materials scientists involved in research and development of organic semiconductor and nonlinear optical materials and devices

Comprehensively examines the properties of organic optoelectronic and nonlinear optical materials Discusses their applications in different devices including solar cells LEDs and electronic memory devices An essential technical resource for physicists chemists electrical engineers and materials scientists **Laser Spectroscopy for Sensing** Matthieu Baudalet, 2014-02-15 Laser spectroscopy is a valuable tool for sensing and chemical analysis Developments in lasers detectors and mathematical analytical tools have led to improvements in the sensitivity and selectivity of spectroscopic techniques and extended their fields of application Laser Spectroscopy for Sensing examines these advances and how laser spectroscopy can be used in a diverse range of industrial medical and environmental applications Part one reviews basic concepts of atomic and molecular processes and presents the fundamentals of laser technology for controlling the spectral and temporal aspects of laser excitation In addition it explains the selectivity sensitivity and stability of the measurements the construction of databases and the automation of data analysis by machine learning Part two explores laser spectroscopy techniques including cavity based absorption spectroscopy and the use of photo acoustic spectroscopy to acquire absorption spectra of gases and condensed media These chapters discuss imaging methods using laser induced fluorescence and phosphorescence spectroscopies before focusing on light detection and ranging photothermal spectroscopy and terahertz spectroscopy Part three covers a variety of applications of these techniques particularly the detection of chemical biological and explosive threats as well as their use in medicine and forensic science Finally the book examines spectroscopic analysis of industrial materials and their applications in nuclear research and industry The text provides readers with a broad overview of the techniques and applications of laser spectroscopy for sensing It is of great interest to laser scientists and engineers as well as professionals using lasers for medical applications environmental applications military applications and material processing Presents the fundamentals of laser technology for controlling the spectral and temporal aspects of laser excitation Explores laser spectroscopy techniques including cavity based absorption spectroscopy and the use of photo acoustic spectroscopy to acquire absorption spectra of gases and condensed media Considers spectroscopic analysis of industrial materials and their applications in nuclear research and industry **Smart Sensors and MEMS** S Nihitjanov, A. Luque, 2014-03-24 Smart sensors and MEMS can include a variety of devices and systems that have a high level of functionality They do this either by integrating multiple sensing and actuating modes into one device or else by integrating sensing and actuating with information processing analog to digital conversion and memory functions Part one outlines the industrial applications for smart sensors covering direct interface circuits for sensors capacitive sensors for displacement measurement in the sub nanometer range integrated inductive displacement sensors for harsh industrial environments advanced silicon radiation detectors in the vacuum ultraviolet VUV and extreme ultraviolet EUV spectral range and advanced optical incremental sensors encoders and interferometers among other topics The second part of the book describes the industrial applications of smart micro electro mechanical systems MEMS Some of the topics covered in this section include

microfabrication technologies used for creating smart devices for industrial applications microactuators dynamic behaviour of smart MEMS in industrial applications MEMS integrating motion and displacement sensors MEMS print heads for industrial printing Photovoltaic and fuel cells in power MEMS for smart energy management and radio frequency RF MEMS for smart communication microsystems Smart sensors and MEMS is invaluable reference for academics materials scientists and electrical engineers working in the microelectronics sensors and micromechanics industry and engineers looking for industrial sensing monitoring and automation solutions Outlines industrial applications for smart sensors and smart MEMS Covers smart sensors including capacitive inductive resistive and magnetic sensors and sensors to detect radiation and measure temperature Covers smart MEMS including power MEMS radio frequency MEMS optical MEMS inertial MEMS and microreaction chambers

Printed Films Maria Prudenziati, Jacob Hormadaly, 2012-08-30 Whilst printed films are currently used in varied devices across a wide range of fields research into their development and properties is increasingly uncovering even greater potential Printed films provides comprehensive coverage of the most significant recent developments in printed films and their applications Materials and properties of printed films are the focus of part one beginning with a review of the concepts technologies and materials involved in their production and use Printed films as electrical components and silicon metallization for solar cells are discussed as are conduction mechanisms in printed film resistors and thick films in packaging and microelectronics Part two goes on to review the varied applications of printed films in devices Printed resistive sensors are considered as is the role of printed films in capacitive piezoelectric and pyroelectric sensors mechanical micro systems and gas sensors The applications of printed films in biosensors actuators heater elements varistors and polymer solar cells are then explored followed by a review of screen printing for the fabrication of solid oxide fuel cells and laser printed micro and meso scale power generating devices With its distinguished editors and international team of expert contributors Printed films is a key text for anyone working in such fields as microelectronics fuel cell and sensor technology in both industry and academia Provides a comprehensive analysis of the most significant recent developments in printed films and their applications Reviews the concepts properties technologies and materials involved in the production and use of printed films Analyses the varied applications of printed films in devices including printed restrictive sensors for physical quantities and printed thick film mechanical micro systems MEMS among others

Industrial Wireless Sensor Networks R Budampati, S Kolavennu, 2015-10-23 Industrial Wireless Sensor Networks Monitoring Control and Automation explores the explosive growth that has occurred in the use of wireless sensor networks in a variety of applications during the last few years As wireless technology can reduce costs increase productivity and ease maintenance the book looks at the progress in standardization efforts regarding reliability security performance power consumption and integration Early sections of the book discuss issues such as media access control MAC antenna design and site survey energy harvesting and explosion proof design Subsequent sections present WSN standards including ISA100

ZigBee™ Wi-Fi™ WirelessHART™ and 6LoWPAN and the applications of WSNs in the oil and gas chemical food and nuclear power industries Reviews technologies and standards for industrial wireless sensor networks Considers particular applications for the technology and their ability to reduce costs increase productivity and ease maintenance Focuses on industry needs and standardization efforts regarding reliability security performance power consumption and integration

Nanosensors for Chemical and Biological Applications Kevin C. Honeychurch, 2014-02-28 Nano scale materials are proving attractive for a new generation of devices due to their unique properties They are used to create fast responding sensors with good sensitivity and selectivity for the detection of chemical species and biological agents Nanosensors for Chemical and Biological Applications provides an overview of developments brought about by the application of nanotechnology for both chemical and biological sensor development Part one addresses electrochemical nanosensors and their applications for enhanced biomedical sensing including blood glucose and trace metal ion analysis Part two goes on to discuss spectrographic nanosensors with chapters on the use of nanoparticle sensors for biochemical and environmental sensing and other techniques for detecting nanoparticles in the environment Nanosensors for Chemical and Biological Applications serves as a standard reference for R D managers in a range of industrial sectors including nanotechnology electronics biotechnology magnetic and optical materials and sensors technology as well as researchers and academics with an interest in these fields Reviews the range electrochemical nanosensors including the use of carbon nanotubes glucose nanosensors chemiresistor sensors using metal oxides and nanoparticles Discusses spectrographic nanosensors such as surface enhanced Raman scattering SERS nanoparticle sensors the use of coated gold nanoparticles and semiconductor quantum dots

Chalcogenide Glasses J-L Adam, X. Zhang, 2014-02-14 The unique properties and functionalities of chalcogenide glasses make them promising materials for photonic applications Chalcogenide glasses are transparent from the visible to the near infrared region and can be moulded into lenses or drawn into fibres They have useful commercial applications as components for lenses for infrared cameras and chalcogenide glass fibres and optical components are used in waveguides for use with lasers for optical switching chemical and temperature sensing and phase change memories Chalcogenide glasses comprehensively reviews the latest technological advances in this field and the industrial applications of the technology Part one outlines the preparation methods and properties of chalcogenide glasses including the thermal properties structure and optical properties before going on to discuss mean coordination and topological constraints in chalcogenide network glasses and the photo induced phenomena in chalcogenide glasses This section also covers the ionic conductivity and physical aging of chalcogenide glasses deposition techniques for chalcogenide thin films and transparent chalcogenide glass ceramics Part two explores the applications of chalcogenide glasses Topics discussed include rare earth doped chalcogenide glass for lasers and amplifiers the applications of chalcogenide glasses for infrared sensing microstructured optical fibres for infrared applications and chalcogenide glass waveguide devices for all optical signal

processing This section also discusses the control of light on the nanoscale with chalcogenide thin films chalcogenide glass resists for lithography and chalcogenide for phase change optical and electrical memories The book concludes with an overview of chalcogenide glasses as electrolytes for batteries Chalcogenide glasses comprehensively reviews the latest technological advances and applications of chalcogenide glasses and is an essential text for academics materials scientists and electrical engineers working in the photonics and optoelectronics industry Outlines preparation methods and properties and explores applications of chalcogenide glasses Covers the ionic conductivity and physical aging of chalcogenide glasses deposition techniques for chalcogenide thin films and transparent chalcogenide glass ceramics Discusses the control of light on the nanoscale with chalcogenide thin films chalcogenide glass resists for lithography and chalcogenide for phase change optical and electrical memories

Graphene Viera Skakalova, Alan B. Kaiser, 2014-02-16 Graphene Properties Preparation Characterisation and Devices reviews the preparation and properties of this exciting material Graphene is a single atom thick sheet of carbon with properties such as the ability to conduct light and electrons which could make it potentially suitable for a variety of devices and applications including electronics sensors and photonics Chapters in part one explore the preparation of including epitaxial growth of graphene on silicon carbide chemical vapor deposition CVD growth of graphene films chemically derived graphene and graphene produced by electrochemical exfoliation Part two focuses on the characterization of graphene using techniques including transmission electron microscopy TEM scanning tunneling microscopy STM and Raman spectroscopy These chapters also discuss photoemission of low dimensional carbon systems Finally chapters in part three discuss electronic transport properties of graphene and graphene devices This part highlights electronic transport in bilayer graphene single charge transport and the effect of adsorbents on electronic transport in graphene It also explores graphene spintronics and nano electro mechanics NEMS Graphene is a comprehensive resource for academics materials scientists and electrical engineers working in the microelectronics and optoelectronics industries Explores the graphene preparation techniques including epitaxial growth on silicon carbide chemical vapor deposition CVD chemical derivation and electrochemical exfoliation Focuses on the characterization of graphene using transmission electron microscopy TEM scanning tunneling microscopy STM and Raman spectroscopy A comprehensive resource for academics materials scientists and electrical engineers

Handbook of Terahertz Technology for Imaging, Sensing and Communications D Saeedkia, 2013-01-16 The recent development of easy to use sources and detectors of terahertz radiation has enabled growth in applications of terahertz Thz imaging and sensing This vastly adaptable technology offers great potential across a wide range of areas and the Handbook of terahertz technology for imaging sensing and communications explores the fundamental principles important developments and key applications emerging in this exciting field Part one provides an authoritative introduction to the fundamentals of terahertz technology for imaging sensing and communications The generation detection and emission of waves are discussed alongside fundamental aspects of surface

plasmon polaritons terahertz near field imaging and sensing room temperature terahertz detectors and terahertz wireless communications Part two goes on to discuss recent progress and such novel techniques in terahertz technology as terahertz bio sensing array imagers and resonant field enhancement of terahertz waves Fiber coupled time domain spectroscopy systems THz TDS terahertz photomixer systems terahertz nanotechnology frequency metrology and semiconductor material development for terahertz applications are all reviewed Finally applications of terahertz technology are explored in part three including applications in tomographic imaging and material spectroscopy art conservation and the aerospace wood products semiconductor and pharmaceutical industries With its distinguished editor and international team of expert contributors the Handbook of terahertz technology for imaging sensing and communications is an authoritative guide to the field for laser engineers manufacturers of sensing devices and imaging equipment security companies the military professionals working in process monitoring and academics interested in this field Examines techniques for the generation and detection of terahertz waves Discusses material development for terahertz applications Explores applications in tomographic imaging art conservation and the pharmaceutical and aerospace industries

Silicon-On-Insulator (SOI) Technology O. Kononchuk, B.-Y. Nguyen, 2014-06-19 Silicon On Insulator SOI Technology Manufacture and Applications covers SOI transistors and circuits manufacture and reliability The book also looks at applications such as memory power devices and photonics The book is divided into two parts part one covers SOI materials and manufacture while part two covers SOI devices and applications The book begins with chapters that introduce techniques for manufacturing SOI wafer technology the electrical properties of advanced SOI materials and modeling short channel SOI semiconductor transistors Both partially depleted and fully depleted SOI technologies are considered Chapters 6 and 7 concern junctionless and fin on oxide field effect transistors The challenges of variability and electrostatic discharge in CMOS devices are also addressed Part two covers recent and established technologies These include SOI transistors for radio frequency applications SOI CMOS circuits for ultralow power applications and improving device performance by using 3D integration of SOI integrated circuits Finally chapters 13 and 14 consider SOI technology for photonic integrated circuits and for micro electromechanical systems and nano electromechanical sensors The extensive coverage provided by Silicon On Insulator SOI Technology makes the book a central resource for those working in the semiconductor industry for circuit design engineers and for academics It is also important for electrical engineers in the automotive and consumer electronics sectors Covers SOI transistors and circuits as well as manufacturing processes and reliability Looks at applications such as memory power devices and photonics

Sensor Technologies for Civil Infrastructures, Volume 1 Jerome P. Lynch, Hoon Sohn, Ming L. Wang, 2014-04-26 Sensors are used for civil infrastructure performance assessment and health monitoring and have evolved significantly through developments in materials and methodologies Sensor Technologies for Civil Infrastructure Volume I provides an overview of sensor hardware and its use in data collection The first chapters provide an introduction to sensing for structural

performance assessment and health monitoring and an overview of commonly used sensors and their data acquisition systems Further chapters address different types of sensor including piezoelectric transducers fiber optic sensors acoustic emission sensors and electromagnetic sensors and the use of these sensors for assessing and monitoring civil infrastructures Developments in technologies applied to civil infrastructure performance assessment are also discussed including radar technology micro electro mechanical systems MEMS and nanotechnology Sensor Technologies for Civil Infrastructure provides a standard reference for structural and civil engineers electronics engineers and academics with an interest in the field Describes sensing hardware and data collection covering a variety of sensors Examines fiber optic systems acoustic emission piezoelectric sensors electromagnetic sensors ultrasonic methods and radar and millimeter wave technology Covers strain gauges micro electro mechanical systems MEMS multifunctional materials and nanotechnology for sensing and vision based sensing and lasers

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

Photonic and Electronic Properties of Fluoride Materials Alain Tressaud, Kenneth R. Poeppelmeier, 2016-03-15 Photonic and Electronic Properties of Fluoride Materials Progress in Fluorine Science the first volume in this new Elsevier series provides an overview of the important optical magnetic and non linear properties of fluoride materials Beginning with a brief review of relevant synthesis methods from single crystals to nanopowders this volume offers valuable insight for inorganic chemistry and materials science researchers Edited and written by leaders in the field this book explores the practical aspects of working with these materials presenting a large number of examples from

inorganic fluorides in which the type of bonding occurring between fluorine and transition metals either d or 4f series give rise to peculiar properties in many fundamental and applicative domains This one of a kind resource also includes several chapters covering functional organic fluorides used in nano electronics in particular in liquid crystal devices in organic light emitting diodes or in organic dyes for sensitized solar cells The book describes major advances and breakthroughs achieved by the use of fluoride materials in important domains such as superconductivity luminescence laser properties multiferroism transport properties and more recently in fluoro perovskite for dye sensitized solar cells and inorganic fluoride materials for NLO and supports future development in these varied and key areas The book is edited by Alain Tressaud past chair and founder of the CNRS French Fluorine Network Each book in the collection includes the work of highly respected volume editors and contributors from both academia and industry to bring valuable and varied content to this active field Provides unique coverage of the physical properties of fluoride materials for chemists and material scientists Begins with a brief review of relevant synthesis methods from single crystals to nanopowders Includes valuable information about functional organic fluorides used in nano electronics in particular in liquid crystal devices in organic light emitting diodes or in organic dyes for sensitized solar cells

Handbook of Flexible Organic Electronics Stergios Logothetidis, 2014-12-03 Organic flexible electronics represent a highly promising technology that will provide increased functionality and the potential to meet future challenges of scalability flexibility low power consumption light weight and reduced cost They will find new applications because they can be used with curved surfaces and incorporated in to a number of products that could not support traditional electronics The book covers device physics processing and manufacturing technologies circuits and packaging metrology and diagnostic tools architectures and systems engineering Part one covers the production properties and characterisation of flexible organic materials and part two looks at applications for flexible organic devices Reviews the properties and production of various flexible organic materials Describes the integration technologies of flexible organic electronics and their manufacturing methods Looks at the application of flexible organic materials in smart integrated systems and circuits chemical sensors microfluidic devices organic non volatile memory devices and printed batteries and other power storage devices

Handbook of Mems for Wireless and Mobile Applications Deepak Uttamchandani, 2013-08-31 The increasing demand for mobile and wireless sensing necessitates the use of highly integrated technology featuring small size low weight high performance and low cost micro electro mechanical systems MEMS can meet this need The Handbook of MEMS for wireless and mobile applications provides a comprehensive overview of radio frequency RF MEMS technologies and explores the use of these technologies over a wide range of application areas Part one provides an introduction to the use of RF MEMS as an enabling technology for wireless applications Chapters review RF MEMS technology and applications as a whole before moving on to describe specific technologies for wireless applications including passive components phase shifters and antennas Packaging and reliability of RF MEMS is also discussed Chapters

in part two focus on wireless techniques and applications of wireless MEMS including biomedical applications such as implantable MEMS intraocular pressure sensors and wireless drug delivery Further chapters highlight the use of RF MEMS for automotive radar the monitoring of telecommunications reliability using wireless MEMS and the use of optical MEMS displays in portable electronics With its distinguished editor and international team of expert authors the Handbook of MEMS for wireless and mobile applications is a technical resource for MEMS manufacturers the electronics industry and scientists engineers and academics working on MEMS and wireless systems Reviews the use of radio frequency RF MEMS as an enabling technology for wireless applications Discusses wireless techniques and applications of wireless MEMS including biomedical applications Describes monitoring structures and the environment with wireless MEMS

Metallic Films for Electronic, Optical and Magnetic Applications Katayun Barmak, Kevin Coffey, 2014-02-13 Metallic films play an important role in modern technologies such as integrated circuits information storage displays sensors and coatings Metallic Films for Electronic Optical and Magnetic Applications reviews the structure processing and properties of metallic films Part one explores the structure of metallic films using characterization methods such as x ray diffraction and transmission electron microscopy This part also encompasses the processing of metallic films including structure formation during deposition and post deposition reactions and phase transformations Chapters in part two focus on the properties of metallic films including mechanical electrical magnetic optical and thermal properties Metallic Films for Electronic Optical and Magnetic Applications is a technical resource for electronics components manufacturers scientists and engineers working in the semiconductor industry product developers of sensors displays and other optoelectronic devices and academics working in the field Explores the structure of metallic films using characterization methods such as x ray diffraction and transmission electron microscopy Discusses processing of metallic films including structure formation during deposition and post deposition reactions and phase transformations Focuses on the properties of metallic films including mechanical electrical magnetic optical and thermal properties

Handbook of Laser Welding Technologies Seiji Katayama, 2013-06-30 Laser welding is a rapidly developing and versatile technology which has found increasing applications in industry and manufacturing It allows the precision welding of small and hard to reach areas and is particularly suitable for operation under computer or robotic control The Handbook of laser welding technologies reviews the latest developments in the field and how they can be used across a variety of applications Part one provides an introduction to the fundamentals of laser welding before moving on to explore developments in established technologies including CO2 laser welding disk laser welding and laser micro welding technology Part two highlights laser welding technologies for various materials including aluminium and titanium alloys plastics and glass Part three focuses on developments in emerging laser welding technologies with chapters on the applications of robotics in laser welding and developments in the modelling and simulation of laser and hybrid laser welding Finally part four explores the applications of laser welding in the automotive railway and shipbuilding

industries The Handbook of laser welding technologies is a technical resource for researchers and engineers using laser welding technologies professionals requiring an understanding of laser welding techniques and academics interested in the field Provides an introduction to the fundamentals of laser welding including characteristics welding defects and evolution of laser welding Discusses developments in a number of techniques including disk conduction and laser micro welding Focusses on technologies for particular materials such as light metal alloys plastics and glass

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

Waste Electrical and Electronic Equipment (WEEE) Handbook Vannessa Goodship, Ab Stevels, Jaco Huisman, 2012-08-30 Electrical and electronic waste is a growing problem as volumes are increasing fast Rapid product innovation and replacement especially in information and communication technologies ICT combined with the migration from analog to digital technologies and to flat screen televisions and monitors has resulted in some electronic products quickly reaching the end of their life The EU directive on waste electrical and electronic equipment WEEE aims to minimise WEEE by putting organizational and financial responsibility on producers and distributors for collection treatment recycling and recovery of WEEE Therefore all stakeholders need to be well informed about their WEEE responsibilities and options While focussing on the EU this book draws lessons for policy and practice from all over the world Part one introduces the reader to legislation and initiatives to

manage WEEE Part two discusses technologies for the refurbishment treatment and recycling of waste electronics Part three focuses on electronic products that present particular challenges for recyclers Part four explores sustainable design of electronics and supply chains Part five discusses national and regional WEEE management schemes and part six looks at corporate WEEE management strategies With an authoritative collection of chapters from an international team of authors Waste electrical and electronic equipment WEEE handbook is designed to be used as a reference by policy makers producers and treatment operators in both the developed and developing world Draws lessons for waste electrical and electronic equipment WEEE policy and practice from around the world Discusses legislation and initiatives to manage WEEE including global e waste initiatives EU legislation relating to electronic waste and eco efficiency evaluation of WEEE take back systems Sections cover technologies for refurbishment treatment and recycling of waste sustainable design of electronics and supply chains national and regional waste management schemes and corporate WEEE management strategies

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