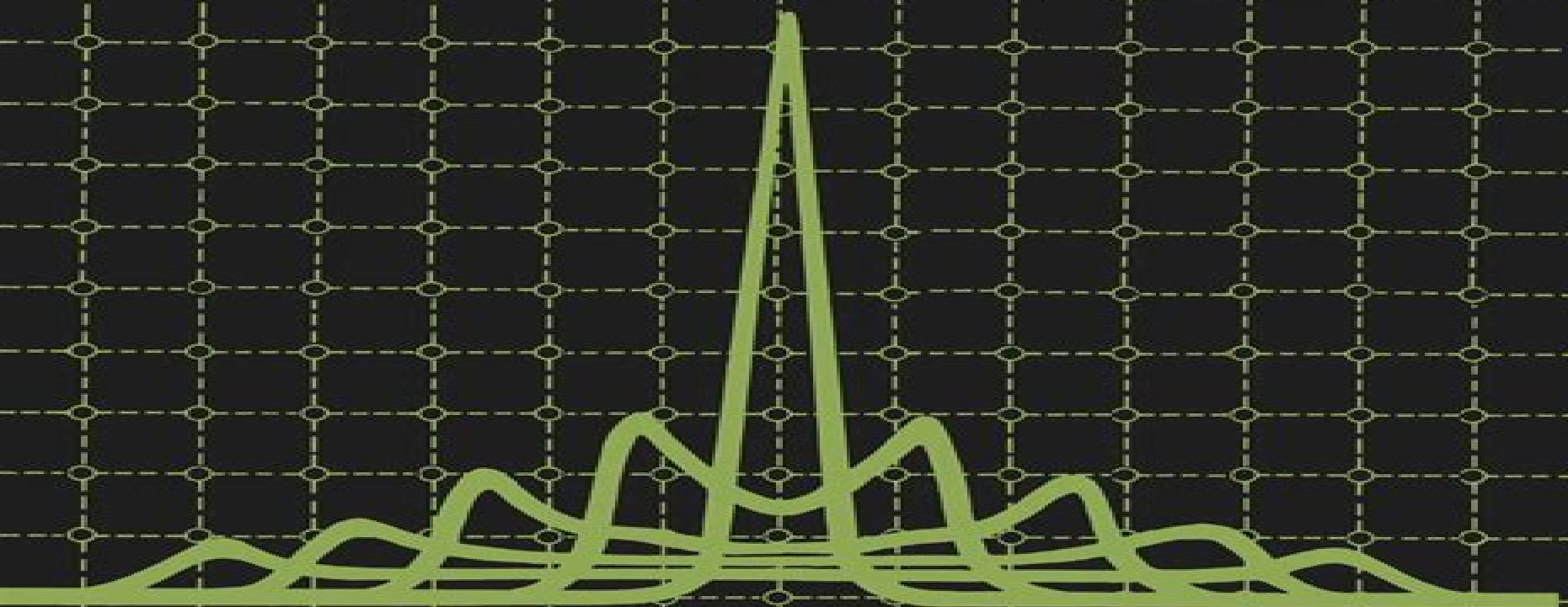


LONG-WAVELENGTH SEMICONDUCTOR LASERS

G.P. AGRAWAL
N.K. DUTTA



Long Wavelength Semiconductor Lasers

**Prasanta Kumar Basu, Bratati
Mukhopadhyay, Rikmantra Basu**



Long Wavelength Semiconductor Lasers:

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semiconductor lasers emitting in the near infrared region of 0.8–0.9 μm resulted in their use for the first generation of optical fiber communication systems. However, to take advantage of low losses in silica fibers occurring around 1.3 and 1.55 μm , the emphasis soon shifted toward long wavelength semiconductor lasers. The material system of choice in this wavelength range has been the quaternary alloy InGaAsP. During the last five years or so, the intense development effort devoted to InGaAsP lasers has resulted in a technology mature enough that lightwave transmission systems using InGaAsP lasers are currently being deployed throughout the world. This book is intended to provide a comprehensive account of long wavelength semiconductor lasers. Particular attention is paid to InGaAsP lasers, although we also consider semiconductor lasers operating at longer wavelengths. The objective is to provide an up-to-date understanding of semiconductor lasers while incorporating recent research results that are not yet available in the book form. Although InGaAsP lasers are often used as an example, the basic concepts discussed in this text apply to all semiconductor lasers irrespective of their wavelengths.

Long-Wavelength Infrared Semiconductor Lasers Hong K. Choi, 2004-03-18. Long wavelength Infrared Semiconductor Lasers provides a comprehensive review of the current status of semiconductor coherent sources emitting in the mid to far infrared spectrum and their applications. It includes three topics not covered in any previous book: far infrared emission from photo mixers as well as from hot hole lasers and InP based lasers emitting beyond two micrometers. Semiconductor lasers emitting at more than two micrometers have many applications such as in trace gas analysis, environmental monitoring, and industrial process control. Because of very rapid progress in recent years, until this book, no comprehensive information beyond scattered journal articles is available at present.

Design and Fabrication of High Speed, Long Wavelength, Semiconductor Lasers John Gilmary Wasserbauer, 1994.

Semiconductor Lasers for Long-wavelength Optical-fibre Communications Systems M. J. Adams, 1987.

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InGaAsNSb Xiaoping Yang, 2002.

Long Wavelength Infrared Emitters Based on Quantum Wells and Superlattices Manfred Helm, 2000-10-31. This book offers a thorough survey of long wavelength infrared semiconductor emitters based primarily on quantum wells and superlattices. Featuring contributions from the most prominent researchers in the field, this volume allows readers to compare different types of lasers as well as examine investigations of potential far infrared terahertz sources. This is an essential reference for researchers, engineers, and graduate students who wish to obtain comprehensive knowledge about infrared semiconductor sources and recent developments in this field.

Semiconductor Lasers II Eli Kapon, 1999-01-12. This volume presents state-of-the-art information on several important material systems and device structures employed in modern semiconductor lasers. The first two chapters discuss several III-V, II-VI, and VI-VI compound semiconductor material systems employed in diode lasers whose emission spectra cover the range from the blue to the mid infrared. Subsequent chapters describe the elaboration of special laser structures designed for achieving narrow spectral linewidths and wavelength tunability as well as high power emission.

devices The last chapter covers the development of surface emitting diode lasers particularly vertical cavity structures In all five chapters the underlying device physics as well as the state of the art and future trends are discussed This book introduces the non expert to the design and fabrication issues involved in the development of these important laser devices In addition it reviews the current status of the different material systems and cavity configurations for the benefit of readers engaged in research in this field Useful background material related to the fundamentals of lasing in semiconductors can be found in the companion volume Semiconductor Lasers I Fundamentals Covers important recent advances in materials design fabrication and device structure of semiconductor lasers aspects not covered in previously existing literature Introduces the non expert to the subject Useful for professionals engaged in research and development Numerous schematic and data containing illustrations Written by leading experts in the field

Long-Wavelength Infrared Semiconductor Lasers Hong K Choi,2004

Long Wavelength Semiconductor Lasers Development for Infrared Heterodyne Applications National Aeronautics and Space Adm Nasa,2018-12-29 PbSnTe single crystals were grown in a new 3 zone furnace Molecular beam epitaxy MBE growth parameters have been established including beam flux vs temperature and growth rates and dopant vs PbTe flux ratios for the various effusion sources involved Lattice matching studies were conducted and doping studies were completed Broad area Pb 1 x Sn x Te double heterostructure lasers were fabricated with active layer compositions up to x equals 0 04 at percent Sn in the active layers Electrical and optical test data are presented Feit Zeev and Kostyk Douglas NASA CR 189243 NAS 1 26 189243 NAS5 30445

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

Principles of Lasers Orazio Svelto,2010-03-16 This fifth edition of Principles of Lasers includes corrections to the previous edition as well as being the first available as an ebook Its mission remains to provide a

broad unified description of laser behavior physics technology and applications Semiconductor Laser Theory Prasanta Kumar Basu, Bratati Mukhopadhyay, Rikmantra Basu, 2015-06-17 Developed from the authors classroom tested material Semiconductor Laser Theory takes a semiclassical approach to teaching the principles structure and applications of semiconductor lasers Designed for graduate students in physics electrical engineering and materials science the text covers many recent developments including diode lasers u **Process Technology for Semiconductor Lasers** Kenichi Iga, Susumu Kinoshita, 2013-03-07 Process Technology for Semiconductor Lasers describes the design principles of semiconductor lasers mainly from the fabrication point of view A review is given of the history of semiconductor laser development and applications and of the materials used in lasing at short to long wavelengths The basic design principles for semiconductor laser devices and the epitaxy for laser production are discussed An entire chapter is devoted to the technology of liquid phase epitaxy and another one to vapor phase and beam epitaxies The characterizations of laser materials and the fabrication and characteristics of semiconductor lasers are treated Mode control techniques are presented and surface emitting lasers are introduced in the final chapter **History Of Modern Optics And Optoelectronics Development In China** Shouyun Tan, 2014-06-11 This book presents a collection of memoir papers on the development of modern and contemporary optics and optoelectronics in China from the 18th to 20th centuries The papers were written by famous scientists in China including members of the Chinese Academy of Sciences and the Chinese Academy of Engineering sharing their experience in different fields of optics and optoelectronics development This is a unique book in understanding the natural science history of optics and optoelectronics It gives you the general idea about how the western optical science spread to China in the 17th to 18th century the cradle of the contemporary optics in China Birth development and application of lasers in China high energy and high power lasers for laser antiballistic missile and laser nuclear fusion development of Chinese optical communication and optical information storage laser and infrared optics research for space science development of Chinese optical instruments etc **Distributed Feedback Laser Diodes and Optical Tunable Filters** Dr. H. Ghafouri-Shiraz, 2004-02-06 Advances in optical fibre based communications systems have played a crucial role in the development of the information highway By offering a single mode oscillation and narrow spectral output distributed feedback DFB semiconductor laser diodes offer excellent optical light sources as well as optical filters for fibre based communications and dense wavelength division multiplexing DWDM systems This comprehensive text focuses on the basic working principles of DFB laser diodes and optical filters and details the development of a new technique for enhanced system performance Considers the optical waveguiding characteristics and properties of semiconductor materials and the physics of DFB semiconductor lasers Presents a powerful modelling technique based on the transfer matrix method which can be used to improve the design of laser diodes optical fibres and amplifiers Examines the effect of the various corrugation shapes on the coupling coefficients and lasing characteristics of DFB laser diodes Technical advice to improve immunity

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Optical and Microwave Technologies for Telecommunication Networks Otto Strobel, 2016-03-23 This is a self contained book on the foundations and applications of optical and microwave technologies to telecommunication networks application with an emphasis on access local road cars trains vessels and airplanes indoor and in car data transmission as well as for long distance fiber systems and application in outer space and automation technology The book provides a systematic discussion of physics optics electromagnetic wave theory optical fibre technology and the potential and limitations of optical and microwave transmission

Vertical External Cavity Surface Emitting Lasers Michael Jetter, Peter Michler, 2021-09-16 Vertical External Cavity Surface Emitting Lasers Provides comprehensive coverage of the advancement of vertical external cavity surface emitting lasers Vertical external cavity surface emitting lasers VECSELs emit coherent light from the infrared to the visible spectral range with high power output Recent years have seen new device developments such as the mode locked integrated MIXSEL and the membrane external cavity surface emitting laser MECSEL expand the application of VECSELs to include laser cooling spectroscopy telecommunications biophotonics and laser based displays and projectors In Vertical External Cavity Surface Emitting Lasers VECSEL Technology and Applications leading international research groups provide a comprehensive fully up to date account of all fundamental and technological aspects of vertical external cavity surface emitting lasers This unique book reviews the physics and technology of optically pumped disk lasers and discusses the latest developments of VECSEL devices in different wavelength ranges Topics include OP VECSEL physics continuous wave CW lasers frequency doubling carrier dynamics in SESAMs and characterization of nonlinear lensing in VECSEL gain samples This authoritative volume Summarizes new concepts of DBR free and MECSEL lasers for the first time Covers the mode locking concept and its application Provides an overview of the emerging concept of self mode locking Describes the development of next generation OPS laser products Vertical External Cavity Surface Emitting Lasers VECSEL Technology and Applications is an invaluable resource for laser specialists semiconductor physicists optical industry professionals spectroscopists telecommunications engineers and industrial physicists

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