

# **Semiconductor Lasers I**

David J. Klotzkin

#### **Semiconductor Lasers I:**

Semiconductor Lasers I Eli Kapon, 1999-01-12 This book covers the device physics of semiconductor lasers in five chapters written by recognized experts in this field The volume begins by introducing the basic mechanisms of optical gain in semiconductors and the role of quantum confinement in modern quantum well diode lasers Subsequent chapters treat the effects of built in strain one of the important recent advances in the technology of these lasers and the physical mechanisms underlying the dynamics and high speed modulation of these devices. The book concludes with chapters addressing the control of photon states in squeezed light and microcavity structures and electron states in low dimensional quantum wire and quantum dot lasers The book offers useful information for both readers unfamiliar with semiconductor lasers through the introductory parts of each chapter as well as a state of the art discussion of some of the most advanced semiconductor laser structures intended for readers engaged in research in this field This book may also serve as an introduction for the companion volume Semiconductor Lasers II Materials and Structures which presents further details on the different material systems and laser structures used for achieving specific diode laser performance features Introduces the reader to the basics of semiconductor lasers Covers the fundamentals of lasing in semiconductors including quantum confined and microcavity structures Beneficial to readers interested in the more general aspects of semiconductor physics and optoelectronic devices such as quantum confined heterostructures and integrated optics Each chapter contains a thorough introduction to the topic geared toward the non expert followed by an in depth discussion of current technology and future trends Useful for professionals engaged in research and development Contains numerous schematic and data containing illustrations

**Physics of Semiconductor Lasers** B. Mroziewicz, M. Bugajski, W. Nakwaski, 2017-01-31 Written for readers who have some background in solid state physics but do not necessarily possess any knowledge of semiconductor lasers this book provides a comprehensive and concise account of fundamental semiconductor laser physics technology and properties The principles of operation of these lasers are therefore discussed in detail with the interrelations between their design and optical electrical and thermal properties The relative merits of a large number of laser structures and their parameters are described to acquaint the reader with the various aspects of the semiconductor lasers and the trends in their development

**Semiconductor Lasers** Govind P. Agrawal, Niloy K. Dutta, 2013-11-27 Since its invention in 1962 the semiconductor laser has come a long way Advances in material purity and epitaxial growth techniques have led to a variety of semiconductor lasers covering a wide wavelength range of 0 3 100 m. The development during the 1970s of GaAs semiconductor lasers emitting in the near infrared region of 0 8 0 9 m 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 m 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 wave length semiconductor lasers Particular attention is paid to InGaAsP lasers although we also consider semiconductor lasers operating at longer wave lengths The objective is to provide an up to date understanding of semicon ductor 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

Semiconductor-Laser Fundamentals Weng W. Chow, Stephan W. Koch, 2013-03-09 Since Fall of 1993 when we completed the manuscript of our book Semi conductor Laser Physics W W Chow S W Koch and M Sargent III Springer Berlin Heidelberg 1994 many new and exciting developments have taken place in the world of semiconductor lasers Novel laser and ampli fier structures were developed and others for example the VCSEL vertical cavity surface emitting laser and monolithic MOPA master oscillator power amplifier made the transition from research and development to production When investigating some of these systems we discovered instances when de vice performance and thus design depend critically on details of the gain medium properties e g spectral shape and carrier density dependence of the gain and refractive index New material systems were also introduced with optical emission wave lengths spanning from the mid infrared to the ultraviolet Particularly note worthy are laser and light emitting diodes based on the wide bandgap group III nitride and II VI compounds These devices emit in the visible to ultra violet wavelength range which is important for the wide variety of optoelectronic applications While these novel semiconductor laser materi als show many similarities with the more conventional near infrared systems they also possess rather different material parameter combinations These differences appear as band structure modifications and as increased importance of Coulomb effects such that e g excitonic signatures resulting from the at tractive electron hole interaction are generally significantly more prominent in the wide bandgap systems

Long-Wavelength Semiconductor Lasers Govind Agrawal, Niloy K. Dutta, 1986-12-31 Since its invention in 1962 the semiconductor laser has come a long way Advances in material purity and epitaxial growth techniques have led to a variety of semiconductor lasers covering a wide wavelength range of 0 3 100 ILm The development during the 1970s of GaAs semiconductor lasers emitting in the near infrared region of 0 8 0 9 ILm 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 ILm 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 wave length semiconductor lasers Particular attention is paid to InGaAsP lasers although we also consider semiconductor

lasers operating at longer wave lengths The objective is to provide an up to date understanding of semicon ductor 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 Semiconductor Lasers: Basic Physics, Technology, and Design Heinrich Rieck, 1970 Frequency Semiconductor Lasers Jens Buus, 1991 This tutorial text describes the properties of advanced semiconductor lasers in detail Although the text gives a detailed theoretical account a number of practical examples and experimental results are described as well The material presented is at an advanced level and is of particular interest to scientists and engineers with a basic familiarity with semiconductor lasers who would like a description of the properties of single frequency semiconductor lasers and of the possibilities offered by these devices Semiconductor Lasers Junji Ohtsubo, 2006 This monograph describes fascinating recent progress in the field of chaos stability and instability of semiconductor lasers Applications and future prospects are discussed in detail The book emphasizes the various dynamics induced in semiconductor lasers by optical and electronic feedback optical injection and injection current modulation Recent results of both theoretical and experimental investigations are presented Demonstrating applications of semiconductor laser chaos control and noise Semiconductor Lasers describes suppression and chaotic secure communications For those who are interested in optics but not familiar with nonlinear systems a brief introduction to chaos analysis is presented

<u>Introduction to Semiconductor Lasers for Optical Communications</u> David J. Klotzkin,2020-01-07 This updated second edition textbook provides a thorough and accessible treatment of semiconductor lasers from a design and engineering perspective It includes both the physics of devices as well as the engineering designing and testing of practical lasers The material is presented clearly with many examples provided Readers of the book will come to understand the finer aspects of the theory design fabrication and test of these devices and have an excellent background for further study of optoelectronics

**Single Frequency Semiconductor Lasers** Zujie Fang, Haiwen Cai, Gaoting Chen, Ronghui Qu, 2017-07-29 This book systematically introduces the single frequency semiconductor laser which is widely used in many vital advanced technologies such as the laser cooling of atoms and atomic clock high precision measurements and spectroscopy coherent optical communications and advanced optical sensors It presents both the fundamentals and characteristics of semiconductor lasers including basic F P structure and monolithic integrated structures interprets laser noises and their measurements and explains mechanisms and technologies relating to the main aspects of single frequency lasers including external cavity lasers frequency stabilization technologies frequency sweeping optical phase locked loops and so on It paints a clear physical picture of related technologies and reviews new developments in the field as well It will be a useful reference to graduate students researchers and engineers in the field

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