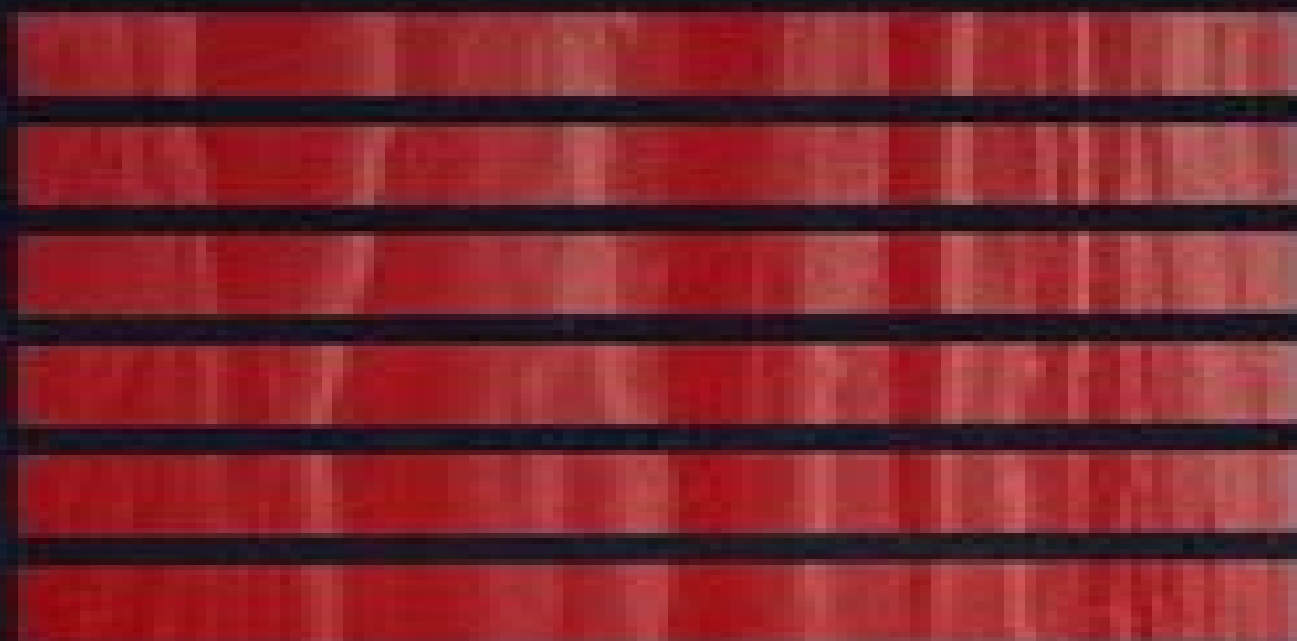


# RELIABILITY AND DEGRADATION OF III-V OPTICAL DEVICES



Osamu Ueda

# Reliability And Degradation Of Iiv Optical Devices

**Jian-Jang Huang, Hao-Chung Kuo, Shyh-Chiang Shen**



## **Reliability And Degradation Of Iii-v Optical Devices:**

Reliability and Degradation of III-V Optical Devices Osamu Ueda, 1996 In developing III V optical devices for use in optical fiber communication systems digital audio systems and optical printers reliability is paramount Understanding the origins and causes of degradation is critical to successful design This unique book focuses specifically on helping researchers and engineers involved in III V compound semiconductor thin film growth and processing better understand the mechanism of degradation and details the major degradation modes of optical devices fabricated from three different systems The book explains the character of defects and imperfections induced during material growth and fabrication presents techniques for failure analysis and describes methods for elimination of defect generating mechanisms More than 200 illustrations and 40 equations help clarify important concepts

Extended Defects in Semiconductors D. B. Holt, B. G. Yacobi, 2007-04-12 The elucidation of the effects of structurally extended defects on electronic properties of materials is especially important in view of the current advances in electronic device development that involve defect control and engineering at the nanometer level This book surveys the properties effects roles and characterization of extended defects in semiconductors The basic properties of extended defects dislocations stacking faults grain boundaries and precipitates are outlined and their effect on the electronic properties of semiconductors their role in semiconductor devices and techniques for their characterization are discussed These topics are among the central issues in the investigation and applications of semiconductors and in the operation of semiconductor devices The authors preface their treatment with an introduction to semiconductor materials and conclude with a chapter on point defect maldistributions This text is suitable for advanced undergraduate and graduate students in materials science and engineering and for those studying semiconductor physics

Defects in Optoelectronic Materials Kazumi Wada, 2001-11-06 Defects in Optoelectronic Materials bridges the gap between device process engineers and defect physicists by describing current problems in device processing and current understanding of these defects based on defect physics The volume covers defects and their behaviors in epitaxial growth in various processes such as plasma processing deposition and implantation and in device degradation This book also provides graduate students cutting edge information on devices and materials interaction

Proceedings of the Symposium on Light Emitting Devices for Optoelectronic Applications and the Twenty-Eighth State-of-the-Art Program on Compound Semiconductors Electrochemical Society. Luminescence and Display Materials Division, Electrochemical Society. Meeting, 1998

Packaging of High Power Semiconductor Lasers Xingsheng Liu, Wei Zhao, Lingling Xiong, Hui Liu, 2014-07-14 This book introduces high power semiconductor laser packaging design The challenges of the design and various packaging and testing techniques are detailed by the authors New technologies and current applications are described in detail

Microprobe Characterization of Optoelectronic Materials Juan Jimenez, 2024-11-01 Each chapter in this book is written by a group of leading experts in one particular type of microprobe technique They emphasize the ability of that technique to provide information about small

structures i.e quantum dots quantum lines microscopic defects strain layer composition and its usefulness as diagnostic technique for device degradation Different types of probes are considered electrons photons and tips and different microscopies optical electron microscopy and tunneling It is an ideal reference for post graduate and experienced researchers as well as for crystal growers and optoelectronic device makers Defect Recognition and Image Processing in Semiconductors 1997 J. Doneker, 2017-11-22 Defect Recognition and Image Processing in Semiconductors 1997 provides a valuable overview of current techniques used to assess monitor and characterize defects from the atomic scale to inhomogeneities in complete silicon wafers This volume addresses advances in defect analyzing techniques and instrumentation and their application to substrates epilayers and devices The book discusses the merits and limits of characterization techniques standardization correlations between defects and device performance including degradation and failure analysis and the adaptation and application of standard characterization techniques to new materials It also examines the impressive advances made possible by the increase in the number of nanoscale scanning techniques now available The book investigates defects in layers and devices and examines the problems that have arisen in characterizing gallium nitride and silicon carbide Spectroscopic Analysis of Optoelectronic Semiconductors Juan Jimenez, Jens W. Tömm, 2016-08-16 This book deals with standard spectroscopic techniques which can be used to analyze semiconductor samples or devices in both bulk micrometer and submicrometer scale The book aims helping experimental physicists and engineers to choose the right analytical spectroscopic technique in order to get specific information about their specific demands For this purpose the techniques including technical details such as apparatus and probed sample region are described More important also the expected outcome from experiments is provided This involves also the link to theory that is not subject of this book and the link to current experimental results in the literature which are presented in a review like style Many special spectroscopic techniques are introduced and their relationship to the standard techniques is revealed Thus the book works also as a type of guide or reference book for people researching in optical spectroscopy of semiconductors **Nitride Semiconductor Light-Emitting Diodes (LEDs)** Jian-Jang Huang, Hao-Chung Kuo, Shyh-Chiang Shen, 2017-10-24 Nitride Semiconductor Light Emitting Diodes LEDs Materials Technologies and Applications Second Edition reviews the fabrication performance and applications of the technology encompassing the state of the art material and device development along with considerations regarding nitride based LED design This updated edition is based on the latest research and advances including two new chapters on LEDs for large displays and laser lighting Chapters cover molecular beam epitaxy MBE growth of nitride semiconductors modern metalorganic chemical vapor deposition MOCVD techniques the growth of nitride based materials and gallium nitride GaN on sapphire and GaN on silicon technologies for LEDs Nanostructured non polar and semi polar nitride based LEDs as well as phosphor coated nitride LEDs are also discussed The book also addresses the performance of nitride LEDs including photonic crystal LEDs surface plasmon enhanced LEDs color tuneable LEDs and LEDs

based on quantum wells and quantum dots Further chapters discuss the development of LED encapsulation technology and fundamental efficiency droop issues in gallium indium nitride GaInN LEDs It is a technical resource for academics physicists materials scientists electrical engineers and those working in the lighting consumer electronics automotive aviation and communications sectors Features new chapters on laser lighting addressing the latest advances on this topic Reviews fabrication performance and applications of this technology that encompass the state of the art material and device development Covers the performance of nitride LEDs including photonic crystal LEDs surface plasmon enhanced LEDs color tuneable LEDs and LEDs based on quantum wells and quantum dots Highlights applications of nitride LEDs including liquid crystal display LCD backlighting infra red emitters and automotive lighting Provides a comprehensive discussion of gallium nitride on both silicon and sapphire substrates

**State-of-the-Art Program on Compound Semiconductors 52 (SOTAPOCS 52)** M. E. Overberg, 2010-10 The papers included in this issue of ECS Transactions were originally presented in the symposium State of the Art Program on Compound Semiconductors 52 SOTAPOCS 52 held during the 218th meeting of The Electrochemical Society in Las Vegas Nevada from October 10 to 15 2010 *Microelectronic System Interconnections* Stuart K. Tewksbury, 1994 Microelectronic system interconnections provides a unique approach to the subject

**Photonics and Optoelectronics in Industry 5.0** Vanita Bhardwaj, Sonal Khurana, Rekha Bhardwaj, 2025-08-10 This book presents the role of photonic and optoelectronics with a focus on transformation of Industry 5.0 This book offers in depth discussion of interfaces between human machine collaboration The introductory chapters discuss the fundamentals of photonics and optoelectronics as well as its use in real time monitoring additive manufacturing and precision machining Additionally focus is placed on sustainability and energy efficiency demonstrating how photonics may enhance industrial processes and assist renewable energy management Finally the book reviews the development of machine learning methods for optimization and the integration of artificial intelligence with photonic systems which are described in ample detail In order to assist researchers those are not familiar with the subfield each chapter starts by providing an overview of the primary concepts to be discussed *III-V Compound Semiconductors* Tingkai Li, Michael Mastro, Armin Dadgar, 2010-12-02 Silicon based microelectronics has steadily improved in various performance to cost metrics But after decades of processor scaling fundamental limitations and considerable new challenges have emerged The integration of compound semiconductors is the leading candidate to address many of these issues and to continue the relentless pursuit of more powerful cost effective processors *III V Compound Semiconductors Integration with Silicon Based Microelectronics* covers recent progress in this area addressing the two major revolutions occurring in the semiconductor industry integration of compound semiconductors into Si microelectronics and their fabrication on large area Si substrates The authors present a scientific and technological exploration of GaN GaAs and III V compound semiconductor devices within Si microelectronics building a fundamental foundation to help readers deal with relevant design and application issues Explores silicon based CMOS

applications developed within the cutting edge DARPA program Providing an overview of systems devices and their component materials this book Describes structure phase diagrams and physical and chemical properties of III V and Si materials as well as integration challenges Focuses on the key merits of GaN including its importance in commercializing a new class of power diodes and transistors Analyzes more traditional III V materials discussing their merits and drawbacks for device integration with Si microelectronics Elucidates properties of III V semiconductors and describes approaches to evaluate and characterize their attributes Introduces novel technologies for the measurement and evaluation of material quality and device properties Investigates state of the art optical devices LEDs Si photonics high speed high power III V materials and devices III V solar cell devices and more Assembling the work of renowned experts this is a reference for scientists and engineers working at the intersection of Si and compound semiconductor technology Its comprehensive coverage is valuable for both students and experts in this burgeoning field

*Two-dimensional Materials for Photodetector* Pramoda Kumar Nayak, 2018-04-04 Atomic thin two dimensional 2D materials are the thinnest forms of materials to ever occur in nature and have the potential to dramatically alter and revolutionize our material world Some of the unique properties of these materials including wide photoresponse wavelength passivated surfaces strong interaction with incident light and high mobility have created tremendous interest in photodetector application This book provides a comprehensive state of the art knowledge about photodetector technology in the range visible to infrared region using various 2D materials including graphene transition metal dichalcogenides III V semiconductor and so on It consists of 10 chapters contributed by a team of experts in this exciting field We believe that this book will provide new opportunities and guidance for the development of next generation 2D photodetector

High-Speed Heterostructure Devices Patrick Roblin, Hans Rohdin, 2002-03-07 Fuelled by rapid growth in communications technology silicon heterostructures and related high speed semiconductors are spearheading the drive toward smaller faster and lower power devices High Speed Heterostructure Devices is a textbook on modern high speed semiconductor devices intended for both graduate students and practising engineers This book is concerned with the underlying physics of heterostructures as well as some of the most recent techniques for modeling and simulating these devices Emphasis is placed on heterostructure devices of the immediate future such as the MODFET HBT and RTD The principles of operation of other devices such as the Bloch Oscillator RITD Gunn diode quantum cascade laser and SOI and LD MOSFETs are also introduced Initially developed for a graduate course taught at Ohio State University the book comes with a complete set of homework problems and a web link to MATLAB programs supporting the lecture material

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Defect Engineering in Semiconductor Growth, Processing, and Device Technology S. Ashok, 1992 Proceedings of the San Francisco meeting of April May 1992 Papers emphasize deliberate and controlled introduction and manipulation of defects in order to engineer some desired properties in

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