

Chapter 1

Heterostructure and Quantum Well Physics

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I. INTRODUCTION

Heterostructures are the building blocks of many of the most advanced semiconductor devices presently being developed and produced. They are essential elements of the highest-performance optical sources and detectors [1,2] and are being employed increasingly in high-speed and

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Heterostructures and Quantum Devices Norman G. Einspruch, William R. Frensley, 2014-06-28 Heterostructure and quantum mechanical devices promise significant improvement in the performance of electronic and optoelectronic integrated circuits ICs Though these devices are the subject of a vigorous research effort the current literature is often either highly technical or narrowly focused This book presents heterostructure and quantum devices to the nonspecialist especially electrical engineers working with high performance semiconductor devices It focuses on a broad base of technical applications using semiconductor physics theory to develop the next generation of electrical engineering devices The text covers existing technologies and future possibilities within a common framework of high performance devices which will have a more immediate impact on advanced semiconductor physics particularly quantum effects and will thus form the basis for longer term technology development *VLSI Electronics: Heterostructures and quantum devices* Norman G.

Einspruch, 1981 **Quantum Well and Superlattice Physics**, 1987 Proceedings of the 12th Annual Conference on the Physics and Chemistry of Semiconductor Interfaces, 29-31 January 1985, Fiesta Inn, Tempe, Arizona Robert S. Bauer, 1985

Fundamentals of Solid State Engineering Manijeh Razeghi, 2006-06-12 Fundamentals of Solid State Engineering 2nd Edition provides a multi disciplinary introduction to Solid State Engineering combining concepts from physics chemistry electrical engineering materials science and mechanical engineering Basic physics concepts are introduced followed by a thorough treatment of the technology for solid state engineering Topics include compound semiconductor bulk and epitaxial thin films growth techniques current semiconductor device processing and nano fabrication technologies Examples of semiconductor devices and a description of their theory of operation are then discussed including transistors semiconductor lasers and photodetectors Revised throughout this second edition includes new chapters on the reciprocal lattice optical properties of semiconductors semiconductor heterostructures semiconductor characterization techniques and an introduction to lasers Additions and improvements have been made to the material on photodetectors and quantum mechanics as well as to the problem sections *Heterostructure Epitaxy and Devices* Josef Novák, Jozef Novák, A.

Schlachetzki, 1996-04-30 Heterostructure Epitaxy and Devices contains a selection of the papers contributed to the NATO Advanced Research Workshop of the same name held near Bratislava in October 1995 Some of the leading research teams in the world present their latest findings which are grouped under five headings Epitaxial growth Heterostructures Composite systems Characterization and Devices **New Technical Books** New York Public Library, 1994 **Scientific and**

Technical Aerospace Reports, 1989 *Encyclopedia of Modern Optics* Robert D. Guenther, Duncan G. Steel, L. P. Bayvel, 2005 Unparalleled reference work for all researchers in field of Optics Fiber Systems Material Science Atomic and Molecular Physics Laser Physics Covers all the sub fields of Optical Physics as well as related fields as Engineering which impact manufacturing and many practical applications Alphabetically arranged for ease of use cross references to aid in

tracking down all aspects of a topic under investigation Dissertation Abstracts International ,1993 Epitaxial Heterostructures: Volume 198 Don W. Shaw,1990-11-20 The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners **Who's who in Technology** Louann Chaudier,1986

Selected Papers on Fundamentals of Optoelectronics Gordon Little,1994 **Comprehensive Semiconductor Science and Technology** ,2024-11-28 Semiconductors are at the heart of modern living Almost everything we do be it work travel communication or entertainment all depend on some feature of semiconductor technology Comprehensive Semiconductor Science and Technology Second Edition Three Volume Set captures the breadth of this important field and presents it in a single source to the large audience who study make and use semiconductor devices Written and edited by a truly international team of experts and newly updated to capture key advancements in the field this work delivers an objective yet cohesive review of the semiconductor world The work is divided into three sections fully updated and expanded from the first edition The first section is concerned with the fundamental physics of semiconductors showing how the electronic features and the lattice dynamics change drastically when systems vary from bulk to a low dimensional structure and further to a nanometer size Throughout this section there is an emphasis on the full understanding of the underlying physics especially quantum phenomena The second section deals largely with the transformation of the conceptual framework of solid state physics into devices and systems which require the growth of high purity or doped bulk and epitaxial materials with low defect density and well controlled electrical and optical properties The third section is devoted to design fabrication and assessment of discrete and integrated semiconductor devices It will cover the entire spectrum of devices we see all around us for telecommunications computing automation displays illumination and consumer electronics Provides a comprehensive global picture of the semiconductor world Written and Edited by an international team of experts Compiles the most important semiconductor knowledge into one comprehensive resource Moves from fundamentals and theory to more advanced knowledge such as applications allowing readers to gain a deeper understanding of the field Materials Modification by Ion Irradiation Emile J. Knystautas,1998 A study of materials modification by ion irradiation The papers address topics such as ion beam modification of polymers nanoclusters and nonlinear optics and photonic integrated circuits and quantum wells Faculty Publications and Doctoral Dissertations University of Illinois at Urbana-Champaign,1978

High Mobility Strained Si/SiGe Heterostructure MOSFETs Christopher W. Leitz,2002 Cont Record mobility strained Si p MOSFETs have been fabricated on relaxed 40% Ge virtual substrates Hole mobility enhancements saturate at virtual substrate compositions of 40% Ge and above with mobility enhancements over twice that of co processed bulk Si devices In contrast hole mobility in strained Si p MOSFETs displays no strong dependence on strained layer thickness These results indicate that strain is the primary variable in determining hole mobility in strained Si p MOSFETs and that symmetric electron and hole mobility enhancements in strained Si MOSFETs can be obtained for virtual substrate compositions beyond

35% Ge The effect of alloy scattering on carrier mobility in tensile strained SiGe surface channel MOSFETs is measured directly for the first time Electron mobility is degraded much more severely than hole mobility in these heterostructures in agreement with theoretical predictions Dual channel heterostructures which consist of the combination of buried compressively strained SiilyGey buried channels and tensile strained Si surface channels grown on relaxed SilxGex virtual substrates are explored in detail for the first time Hole mobilities exceeding 700 cm² V s have been achieved by combining tensile strained Si surface channels and compressively strained 80% Ge buried channels grown on relaxed 50% Ge virtual substrates This layer sequence exhibits nearly symmetric electron and hole mobilities both enhanced relative to bulk Si

Ultrafast Laser Probe Phenomena in Bulk and Microstructure Semiconductors III Robert R. Alfano,1990 **SPIE ...**

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