

1. Record Nr.	UNINA9910830164503321
Titolo	Nitride semiconductor devices [[electronic resource]] : principles and simulation / / edited by Joachim Piprek
Pubbl/distr/stampa	Weinheim, : Wiley-VCH [Chichester, : John Wiley [distributor]], c2007
ISBN	1-280-92162-5 9786610921621 3-527-61072-3 3-527-61071-5
Descrizione fisica	1 online resource (521 p.)
Altri autori (Persone)	PiprekJoachim
Disciplina	537.6223 621.38152
Soggetti	Semiconductors Nitrides
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Nitride Semiconductor Devices: Principles and Simulation; Contents; Preface; List of Contributors; Part 1 Material Properties; 1 Introduction; 1.1 A Brief History; 1.2 Unique Material Properties; 1.3 Thermal Parameters; References; 2 Electron Bandstructure Parameters; 2.1 Introduction; 2.2 Band Structure Models; 2.3 Band Parameters; 2.3.1 GaN; 2.3.2 AlN; 2.3.3 InN; 2.3.4 AlGaIn; 2.3.5 InGaIn; 2.3.6 InAlIn; 2.3.7 AlGaInN; 2.3.8 Band Offsets; 2.4 Conclusions; References; 3 Spontaneous and Piezoelectric Polarization: Basic Theory vs. Practical Recipes 3.1 Why Spontaneous Polarization in III-V Nitrides?3.2 Theoretical Prediction of Polarization Properties in AlN, GaN and InN; 3.3 Piezoelectric and Pyroelectric Effects in III-V Nitrides Nanostructures; 3.4 Polarization Properties in Ternary and Quaternary Alloys: Nonlinear Compositional Dependence and Order vs. Disorder Effects; 3.5 Orientational Dependence of Polarization; References; 4 Transport Parameters for Electrons and Holes; 4.1 Introduction; 4.2 Numerical Simulation Model; 4.2.1 Scattering in the Semi-Classical Boltzmann

Equation; 4.3 Analytical Models for the Transport Parameters
4.4 GaN Transport Parameters
4.4.1 Electron Transport Coefficients;
4.4.2 Hole Transport Coefficients; 4.5 AlN Transport Parameters; 4.5.1
Electron Transport Coefficients; 4.5.2 Hole Transport Coefficients; 4.6
InN Transport Parameters; 4.6.1 Electron Transport Coefficients; 4.6.2
Hole Transport Coefficients; 4.7 Conclusions; References; 5 Optical
Constants of Bulk Nitrides; 5.1 Introduction; 5.2 Dielectric Function and
Band Structure; 5.2.1 Fundamental Relations; 5.2.2 Valence Band
Ordering, Optical Selection Rules and Anisotropy; 5.3 Experimental
Results; 5.3.1 InN; 5.3.2 GaN and AlN
5.3.3 AlGaN Alloys
5.3.4 In-rich InGaN and InAlN Alloys; 5.4 Modeling
of the Dielectric Function; 5.4.1 Analytical Representation of the
Dielectric Function; 5.4.2 Calculation of the Dielectric Function for
Alloys; 5.4.3 Influence of Electric Fields on the Dielectric Function;
References; 6 Intersubband Absorption in AlGaN/GaN Quantum Wells;
6.1 Introduction; 6.2 Theoretical Model; 6.2.1 Spontaneous and
Piezoelectric Polarization; 6.3 Numerical Implementation; 6.3.1
Achieving Self-consistency: The Under-Relaxation Method; 6.3.2
Predictor-Corrector Approach
6.4 Absorption Energy in AlGaN-GaN MQWs
6.4.1 Numerical Analysis of
Periodic AlGaN-GaN MQWs; 6.4.2 Numerical Analysis of Non-periodic
AlGaN-GaN MQWs and Comparison with Experimental Results; 6.5
Conclusions; References; 7 Interband Transitions in InGaN Quantum
Wells; 7.1 Introduction; 7.2 Theory; 7.2.1 Bandstructure and
Wavefunctions; 7.2.2 Semiconductor Bloch Equations; 7.2.3
Semiconductor Luminescence Equations; 7.2.4 Auger Recombination
Processes; 7.3 Theory-Experiment Gain Comparison; 7.4
Absorption/Gain; 7.4.1 General Trends; 7.4.2 Structural Dependence;
7.5 Spontaneous Emission
7.6 Auger Recombinations

Sommario/riassunto

This is the first book to be published on physical principles, mathematical models, and practical simulation of GaN-based devices. Gallium nitride and its related compounds enable the fabrication of highly efficient light-emitting diodes and lasers for a broad spectrum of wavelengths, ranging from red through yellow and green to blue and ultraviolet. Since the breakthrough demonstration of blue laser diodes by Shuji Nakamura in 1995, this field has experienced tremendous growth worldwide. Various applications can be seen in our everyday life, from green traffic lights to full-color outdoor dis
