

Index

A

Abelian groups, 36
Ab-nitio, 23
Absorption coefficient, 89, 213
Acoustic and optical branches, 115
Aluminum nitride, 149
Angular momentum, 43, 96
Anions, 83
Anisotropy, 97, 98
Anisotropy of the optical response, 244
Antisymmetric tensor, 30
A-plane, 144
Artificial, 51
Atomic displacements, 125
Atomic force microscopy, 244
Atomic steps, 51
Axial symmetry, 155
Axial symmetry enlarges them to levels like, 155

B

Back ground dielectric constant, 123
Balance effects of radiative and non radiative recombination channels, 226
Barrier width dependance, 201
Biexcitons, 251
Bloch states, 116
Bloch states and Wannier states, 81
Bloch's theorem, 71
Blue-shift, 198
Born Oppenheimer adiabatic approximation, 65
Born-von Karman cyclic conditions, 74, 114
Bose Einstein statistics, 118
Bosons, 44

Bound excitons and extrinsic recombination processes, 163
Bowing parameter, 172
Bragg relation, 15
Bravais, 3
Breaking of the macroscopic translation and crystal symmetry, 234
Brillouin zone, 16
Broadening, 172
Built-in strain fields, 192
Bulk, 49

C

Cations, 83
Character table, 38, 45
Character table, infrared absorption, 119
Chemical alloy fluctuations, interface localizations, 207
Chemical composition, 24, 51
Chemical disorder and potential fluctuations, 172
Chemical disorder in well layers, 214
Chemical shift, 164
Classes, 38
Coherent growth, 55
Columns, 58
Compatibility table, 45, 46
Compliance tensor, 31
Composition dependance, 201, 202, 210
Compression, 142
Continuum of states, 133
Coordinates, 5
Correlation, 22
Coulomb interactions, 65
Coupled bands, 102
Coupled valence bands scheme, 234

Critical thickness for coherent growth, 187, 188

Crystal field splitting, 100

Crystallographic, 5

Crystallographic basis, 11

Current of probability, 184

D

Darwin term, 96

Defects, 25

Density of state, 70, 144

Dielectric function, 86, 90

Diffraction, 12

Dilatation, 142

Dimensionality of excitonic propagations, 219

Dirac equation, 95

Dislocations, 60

Disordered orientations, 58

Dispersion relation, 76

Dispersion relations in the valence band, 235

Displacement parameter, 21, 22

Distortion, 22

Donor acceptor pairs, 167

Dots and chains, 246

Double group, 43

E

Edge of Brillouin zone, 75

Effective mass, 77, 105

Effective mass equation, 183

Effective potential, 72

Einstein's notation, 34

Elastically scattered, 16

Electric dipole, 23

Ellipsometry, 100

Energy gaps, 75

Energy of strained crystals, 34

Envelope function, 181

Epilayers versus bulks, 159

Epitaxial growth, 52

Epitaxial lateral overgrowth, 62

Equivalent, 4

Excited states, 205, 206

Exciton binding energy, 193

Exciton-LO phonon coupling, 208

Exciton-polariton, 140

Excitonic binding energy in GaN, 133

Excitonic binding: the influence of anisotropies, 154

Excitonic dissociation, 146

Excitons, 91, 92, 132

Excitons and Polaritons in AlN, 150

Excitons in quantum wires, 219

F

Facets, 6

Fermi Golden Rule, 42

Fermions, 44

Field screening, 248

Finite groups, 36

Four-index, 6

Free carriers, 160

Free electron model, 69

Free excitons, 160

Frequency distribution, 113

Full width at half maximum, 162

G

GaNN polar quantum wells, 211

GaP:N, 253

Geometric crystallography, 8

Greenockite, 1

Group, 1, 3, 20, 23, 25, 34–38, 40, 44

Group theory, 36, 101, 110

Group velocity, 112, 144

Growth chamber, 55

Growth protocol, 57

H

Hamilton equations, 108

Häüy, 3

Hegagonal and trigonal shapes, 244

Hermite functions, 118

Heterostructures, 62

Hexagonal, 2

Hexagonal Closed Packed sub-lattice, 19

High photo injection densities, 196

Huang-Rhys factor, 168

Huge Quantum Confined Stark Effect, 210, 211, 233

Huge variations of the oscillator strengths, 203

Hydride Vapor Phase Epitaxy, 53

I

Ideal values, 22

In-plane Bohr radius, 208

Inelastic scattering, 120

Infinite chain, 111

Infrared absorption, 119

Integrals, 41

Interface localizations, 207

Interference, 12
 Internal displacement parameter, 21
 International Union of Crystallography classification, 20
 Intrinsic recombination, 160
 Irreducible representations, 37

J

Joint density of states, 86

K

$k \cdot p$ method, 101
 Knudsen cell, 54

L

Lattice, 4
 Lattice matching, 62
 Laüe, 12
 Light cone and excitonic statistics, 217
 Linear dependence, 201
 Lineshape fitting, 177
 Local electronic density, 18
 Localization, 174
 Localization energy, 164
 Localized excitons, 226
 Localized photoluminescence concept, 232
 Longitudinal transverse splitting energy, 140
 Longitudinal wave, 139
 Long range interaction, 193

M

Matrices, 11
 Matrix element, 99
 Matrix representation, 138
 Melting temperature, 50
 Metal-Organic Vapor Phase Epitaxy, 53
 Microscopic theory, 87
 Miller, 4
 Mineralogist, 4
 Mineralogy, 7
 Minimization procedure, 194
 Mobility edge, 173
 Molecular Beam Epitaxy, 54
 M-plane, 144
 Multi quantum wells, 187
 Multi-band envelope function, 241
 Multiplication table, 45

N

Nearest-neighbour, 21

Near-neighbours interactions, 80
 Negative and positive binding energies, 253
 Non parabolicity, 78
 Non rigid quantum rotator, 164
 Normal coordinates, 106, 107
 Normal modes, 110
 Nucleation, 55
 Nucleation layer, 58
 Numerical approach, 157

O

One electron approximation, 68
 Optical properties of bulk zinc oxide, 150
 Optical properties of non polar quantum wells, 233
 Optical properties of zinc oxide heteroepitaxies, 151
 Optical reflectivity GaN, 141
 Ordering, 23
 Orthogonal, 5, 9
 Orthogonal basis, 11
 Orthogonal transformation, 108
 Orthogonalization, 5
 Orthorhombic GaN, 145
 Oscillator strength, 94, 143, 186
 Overlap integral, 196

P

Parameters, 106
 Pauli spinor, 96
 Pendellosung fringes, 60
 Periodic arrangement, 14
 Periodic potential, 67
 Perturbation, 42
 Phase velocity, 112
 Phenomenology, 99
 Phonon-plasmon interaction, 127
 Phonons, 106
 Phonons and dielectric constant, 121
 Phonons in strained wurtzite, 126
 Photoluminescence, 160
 Photoluminescence intensity versus T, 222
 Photoluminescence using scanning optical microscopy, 232
 Photonic effects in films, 174
 Photorefectance spectroscopy, 206
 Piezoelectric effect, 25
 Piezo electric tensor, 27
 Planes, 6
 Plasmons, 127
 Point group C_{6v} , 40
 Point groups, 19

32 point groups, 26
 Poisson's equation, 197
 Poisson's law, 167
 Polar, 23
 Polar quantum well, 190, 192
 Polaritons, 134
 Polaritons in ZnO, 154
 Powder, 20
 Precursors, 53, 54
 Principle of time resolved spectroscopy, 223
 Projection operators, 40
 Pseudo continuum, 76, 93, 94
 Pyro-electric effect, 25

Q

Quantization of polariton modes, 175
 Quantum Confined Stark Effect, 189
 Quantum dots, 243
 Quantum origin, 24
 Quantum theory of lattice vibrations, 115
 Quantum well, 185, 186
 Quantum wells versus quantum dots in strong localization regimes, 229

R

Radiative and non radiative decay time, 216
 Radiative lifetimes in disordered 2D systems, 228
 Radiative lifetimes versus T, 226
 Radiative lifetimes versus well widths, 228
 Radio-crystallography, 15
 Raman effect, 120
 Rank-four tensor, 31
 Real and imaginary parts of the dielectric function, 91
 Reciprocal lattice, 8, 10
 Recombination for a localized center, 220
 Recombination rate in quantum wires, 220
 Red-shift, 159
 Red-shift, saturation energy, 247
 Reduced band scheme, 76
 Reflection, 14
 Reflectivity, 131
 Reflectivity and photoluminescence, 200
 Representations, 36
 Representation table, 38
 Resonances, 133
 Reticular, 4
 Reticular plane, 9
 RHEED oscillations, 55, 57
 Rhomboidal, 6
 Romé de l'Isle, 3

Rydberg series, 133

S

Saphire, 57
 Scalar product, 9
 Screening of QCSE, 248
 Second nearest neighbour interactions, 82, 83
 Seed, 51
 Selection rule, 20, 42, 125, 132
 Selection rules for two-electron transitions, 171
 Selective reflectivity, 14, 237
 Semiclassical theor, 86
 Semiconductor alloys, 171
 Semipolar and polar orientations: origin of FWHM, 249
 Semipolar orientations and reduction of QCSE, 248
 Semipolar quantum wells, 238
 Shape, 2
 Simple group, 43
 Single dot spectroscopy: spectral diffusion, 250
 Small dots and large dots, 253
 Solution, 49, 50
 Sophisticated, 51
 Space group, 47
 Specific angles, 14
 Spin exchange interaction, 136
 Spin-flip, 137
 Spinless tight binding description, 81
 Spin-orbit interaction, 95
 Spontaneous polarization, 23, 190
 Stacking faults, 25
 Static dielectric constant, 124
 Stiffness tensor, 31
 Stokes shift, 200, 212, 213
 Strain field, 104, 141
 Strain tensor, 29
 Stranski Krastanow, 243
 Stress, 27
 Stress tensor, 28
 Structure factor, 17
 Subgroups, 35
 Superlattice satellite fringes, 63
 Supersaturation, 49
 Symmetric tensor, 30
 Symmetry, 2, 98
 Symmetry classes, 26
 Symmetry of substrate surface, 243
 Symmetry properties of strain tensors, 33

T

Temperature effects, 157
Temperature effects in bulks, 158
Tensors, 11
The influence of well widths, 223
Thermal degradation, 53
Tight binding, 78, 193
Tilt, 58–60
Time-resolved photoluminescence, 223
Transfer matrix approach, 242
Transfer matrix method, 185
Translation group, 46
Transverse and longitudinal waves, 123
Transverse wave, 139
Trial function, 195
Twist, 58–60
Two atom linear chain, 114
Two electron replicas photoluminescence spectra, 171
Two electron transitions, 169
Type I, 182, 187, 200
Type II, 182, 187

V

Vacuum, 54
Valence band dispersions, 102
Valence band hamiltonian, 241
Valence band ordering, 131

Valence missing electron, 137
Van Hove singularities, 89
Vapour phase, 49
Vectorial product, 8
Voigt's representation, 32

W

Wave functions, 156
Wave vector, 83
Wave vectors and selection rules, 237
Weber, 7
Wigner-Seitz cell, 17
Wurtzite, 1

X

X-ray, 11

Y

Yellow band, 168

Z

Zeta function, 92
Zincite, 1
ZnO, 237
Zone indices, 10