

# Index

- ALD, *see* atomic layer deposition  
AlGaAs 257, 266, 268, 273,  
292, 302  
AlGaAs shells 16, 19, 258–260,  
264–270, 272, 300–301  
polycrystalline 258, 266,  
268
- alloys 7, 107–108, 140, 163,  
365
- amorphous glass substrates 213
- annealing 297, 300, 303, 306
- antenna effect 122–124, 152
- arsenic 189–191, 198, 204, 206,  
270
- arsenic atoms 206, 208–209,  
211–212
- atomic layer deposition (ALD)  
85, 89, 474, 484
- Au catalysts 368, 374, 377, 385,  
390
- Au-catalyzed VLS mode 399,  
408–409, 411
- Auger coefficients 443–445
- Auger recombination 19,  
443–444
- axial heterostructures 6–7, 9–10,  
18, 367
- Be-doping 60–61
- bismide nanowires 161–162,  
164, 166, 168, 170, 172
- bismides 162–163
- bismuth 162, 172
- buried GaAs/AlGaAs  
heterostructure  
nanowires, oxidation  
of 271
- buried nanowire structure,  
growth of 261
- cathodoluminescence (CL) 79,  
117, 165, 167, 260,  
274–275, 277, 281, 340,  
402, 417
- CCD, *see* charge-coupled  
device
- charge-coupled device (CCD)  
277, 402
- chemical vapor deposition (CVD)  
7, 58
- CL, *see* cathodoluminescence
- CMOS, *see* complementary  
metal-oxide semiconductor
- complementary metal-oxide  
semiconductor (CMOS) 5,  
384, 397–398
- compound semiconductors 10,  
33, 52, 177, 179, 181,  
256–257, 282–283, 467,  
470–471, 476
- compressive strain 12, 51, 126,  
417
- contaminations 291, 293, 297,  
323, 439
- core-shell nanowires 11, 109,  
147–148, 281, 302

- core–multishell nanowires 489–490
- core–shell nanowires 233, 244, 256, 260, 281, 292, 476–477  
as-grown GaAs–Fe<sub>3</sub>Si 228  
semiconductor–ferromagnet 221, 223
- crystal facets 177, 189, 191, 197–199, 203, 207, 209, 211, 325, 327–328
- crystal facets of nanowires 198, 200
- crystal nucleation 71, 73–74
- crystal orientations 4, 180, 188, 227
- CVD, *see* chemical vapor deposition
- degree of linear polarization (DLP) 343–346
- density functional theory (DFT) 233–234  
*DFT*, *see* density functional theory
- DLP, *see* degree of linear polarization
- dopants 11–12, 499
- doping 5, 11, 14, 19, 46, 61, 87, 116, 347, 349, 351, 357
- dot-in-nanowire structures 441–442
- electron beam 80, 182, 184, 233, 260, 277, 372, 402
- electron beam lithography (EBL) 53, 71, 337–338, 350, 450
- ELO, *see* epitaxial lateral overgrowth
- endotaxy 177, 183, 185, 204, 207, 211
- EOT, *see* effective-oxide thickness
- epitaxial growth 6, 10, 225, 283, 292, 302, 306, 324
- epitaxial growth of GaAs NWs on Si 293, 295
- epitaxial heterostructure nanowires 3–6, 8, 10, 12–14, 16, 18, 20
- epitaxial lateral overgrowth (ELO) 62
- epitaxy 8–9, 438
- EQE, *see* external quantum efficiency
- evaporation coating 69–71
- excitation power density 44–45, 79, 343, 445
- excitons 18, 50, 125–126, 139, 143, 341, 344
- radiative recombination of 114, 117, 119, 138
- external quantum efficiency (EQE) 43, 90, 444, 446
- Fe<sub>3</sub>Si 224, 228, 230, 232–235, 237, 239–241, 244
- Fe<sub>3</sub>Si growth temperatures 227, 236–237, 241–242, 244
- Fe<sub>3</sub>Si nanowire shells 237, 241–242
- Fe<sub>3</sub>Si shell growth temperature 232, 235, 237, 239

- $\text{Fe}_3\text{Si}$  shells 227–229, 231–232, 234–235, 243–245  
 ferromagnetic MnAs/III–V hybrid nanowires for spintronics 177–178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214  
 ferromagnetic MnAs nanoclusters 183  
 FETs  
   *see* field-effect transistors  
   lateral 467, 469, 472  
 field-effect transistors (FETs) 4, 178, 320, 408, 466, 469–470, 474  
 flip-chip bonding 54, 57, 60  
 forward-looking spintronic device applications 222, 224  
 full width at half maximum (FWHM) 39, 49, 52, 92, 150, 167, 371, 444, 448, 450  
 FWHM  
   *see* full width at half maximum spectral 43, 56, 92–93
- Ga adatoms 40, 74, 82–83, 326  
 Ga oxides 297–298, 300, 307  
 GaAs 133–134, 141, 146, 151, 162, 164–165, 171, 179–180, 182–184, 197, 200–202, 205, 211, 224, 229, 232, 234, 237–238, 241, 259, 265–266, 268, 270–271, 294–297, 299, 301–303, 305–309, 470, 476–478, 480  
 bulk 16, 145, 152, 296–297
- GaAs/AlGaAs core–shell nanowires 155, 255, 258, 267, 269, 309, 477  
 GaAs-AlGaAs core–shell nanowires 17  
 GaAs/AlGaAs core–shell nanowires, selective oxidation of 269  
 GaAs/AlGaAs nanowires 258–259  
 GaAs/AlGaO<sub>x</sub> heterostructured nanowires 255–256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280, 282  
 GaAs/AlGaO<sub>x</sub> nanowires 275–276  
 GaAs core 16, 134–135, 148, 228–229, 232–233, 238, 256, 258–259, 264–266, 268–269, 276–281, 283, 301, 304, 309  
   single-crystalline 228  
 GaAs core nanowires 229, 232, 234, 244  
 GaAs-Fe<sub>3</sub>Si core–shell nanowires 225–233, 235, 238–239, 242–245  
 GaAs-Fe<sub>3</sub>Si semiconductor–ferromagnet core–shell nanowires 221–222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244  
 GaAs-Fe<sub>3</sub>Si semiconductor–ferromagnet core–shell nanowires for spintronics 221–222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244  
 GaAs/GaAsBi core–shell nanowires 172

- GaAs/GaAsBi nanowires  
164–166, 171  
multi-shell 164  
single 165  
tilted 164, 166  
GaAs growth 225–226  
GaAs nanowire arrays 185–186  
GaAs nanowire growth 182,  
226, 294, 298, 300, 477  
GaAs nanowire template  
sample 236  
GaAs nanowires 17, 133,  
136–138, 164, 171, 178,  
184–191, 193, 202, 211,  
225, 230–232, 234,  
237, 241, 257, 259, 262,  
265–267, 272, 291–298,  
300–301, 305–307, 398,  
476–477, 500  
growth of 7  
hexagonal 177  
semiconducting 194–195  
GaAs/SrTiO<sub>3</sub> core-shell  
nanowires 291–292, 294,  
296, 298, 300, 302, 304,  
306, 308, 310  
GaAs/SrTiO<sub>3</sub> interface 303, 305,  
307  
GaAs substrates 168–169, 227,  
293  
GaAsBi 163, 166, 171  
GaAsBi alloying nanowires 164  
GaAsBi nanowires 161, 163–165,  
167–172  
optical properties of 169–170  
photoacoustic spectroscopy  
of 170–171  
GaAsBi shell 164–165  
GaN 32, 36, 40, 46, 51, 60, 62,  
65, 70, 72, 74–75, 80,  
83–85, 87, 90–91, 108, 320,  
324, 326, 332, 338–339,  
347, 350, 419, 441, 449,  
452, 454  
crystalline 326  
growth of 40, 68–69, 73, 94,  
321  
GaN-based nanocolumns 31–32,  
51  
GaN nanocolumn arrays 75, 78,  
86  
GaN Nanocolumns 31–34,  
36–42, 44–45, 50, 54,  
58–62, 66–73, 75–76, 87  
arranged 86  
assembled 34, 61  
growth of 36–38, 58, 71  
n-type 47, 52, 58  
GaN nanocolumns, selective-area  
growth of 68–69, 71, 73,  
75  
GaN Nanocolumns, uniform  
arrays of 32, 69  
GaN nanocrystals 69, 323, 325,  
327–330  
GaN nanowire growth 439  
GaN nanowire lasers, single 449,  
457  
GaN nanowires 264, 319,  
321–323, 328, 335–336,  
339, 347–348, 350–351,  
357–358, 439–441,  
450–454  
fabrication of 319, 322–323,  
325, 327, 329, 331, 333,  
347, 349, 351, 353, 355,  
357  
single 441, 449–450, 455  
GaNAs alloy 134, 138, 141, 145,  
148  
GaNAs bandgap energy  
139–140, 142  
GaNP, growth of 108–109

- GaNP alloys 107–108, 111, 118, 121, 134
- GaNP coaxial nanowires, optimizing light emission efficiency of 108–109, 111, 113, 115
- GaNP nanowires 108, 112–113, 116, 121–123, 125, 127
- graphene 58–59
- green-light nanocolumn LEDs 32, 86
- HAADF, *see* high-angle annular dark-field
- HEMTs, *see* high-electron-mobility transistors
- heteroepitaxial growth 8
- heterointerfaces 4, 6, 10, 12, 17, 20, 200, 478, 487  
abrupt 178, 180–181, 199–200, 210, 213
- heterojunction nanowires 180, 198, 201–202, 212
- heterostructure nanowires 12, 15–17
- heterostructures 3–6, 9–10, 13, 19, 87, 116, 133–134, 150, 256, 292, 365–366, 369, 383, 400, 411–412, 414–415, 426, 471, 477
- hexagonal GaAs nanowires 185–186, 189, 191, 211
- high-angle annular dark-field (HAADF) 67, 259, 333, 400
- high-electron-mobility transistors (HEMTs) 471, 475, 488, 490
- HVPE, *see* hydride vapor phase epitaxy
- hybrid nanowires 177–178, 180–181, 188, 192, 194, 196–198, 203, 210–211
- hydride vapor phase epitaxy (HVPE) 38, 58, 68
- ICs, *see* integrated circuits
- III-nitride nanowires 437–438, 440, 442, 444, 446, 448, 450, 452, 454, 456–457
- III-nitride nanowires for photovoltaic applications 452–453, 455
- III-V-Bi nanowires 161, 164, 172
- III-V-Bi nanowires growth mechanisms 173
- III-V bismides nanowires 161, 173
- III-V MOSFETs 474, 488
- III-V nanowires 116, 419, 465, 467, 472, 475–481  
selective-area growth of 475, 477, 479, 481
- III-V NW growth on Si substrates 478
- III-V semiconductor nanowires 133
- In adatoms 419–421, 423, 428
- InAs 59, 179, 181, 183, 199, 203, 205, 207, 211, 347, 369, 397, 411–414, 419, 428, 473, 476, 478, 480
- InAs-GaAs core–shell nanowires 11
- InAs growth 369
- InAs heterostructures 411, 413
- InAs-InAsP core–shell nanowires, PL intensity of 18
- InAs interface 412
- InAs nanowire arrays 196

- InAs nanowire FET 408–409  
 InAs nanowires 178, 182, 184,  
   196–198, 200, 203–206,  
   210, 212, 399, 403–410,  
   476, 480, 482–483, 496  
 InAs quantum disks 400, 414,  
   419, 426–429  
 InAsP shell growth 368  
 InGaAs/InP/InAlAs/InGaAs  
   core–multishell nanowire  
   489–490  
 InGaAs nanowires 485, 490  
 InGaAs NW/n-Si substrate 488  
 InGaN 45, 50, 53, 65–68, 78,  
   80–82, 84–85, 87, 338,  
   441, 443, 445  
   bulk 445, 447  
   core–shell 67–68  
   polar 340–341  
 InGaN-based nanocolumn LEDs  
   45, 52, 84, 90  
 InGaN-based nanocolumns 32  
 InGaN core 67–68  
 InGaN/GaN nanocolumn arrays  
   79, 83, 90  
 InGaN/GaN nanocolumns 58,  
   60, 65–66, 77  
 InGaN-MQD nanocolumns  
   43–44  
 InGaN nanocolumns 67  
 InGaN nanodisk 338, 340–343  
 InGaN nanowire bundles 442  
 InGaN nanowire LEDs 448  
 InGaN nanowire materials 444,  
   449, 452  
 InGaN nanowire solar cells  
   455–456  
 InGaN nanowires 438, 442,  
   444–445, 447–448  
 InGaN quantum disks 337, 339  
 InGaN SQD nanocolumns 53  
 InGaN SQDs 50–51, 53, 60  
 InP/InAs heterostructure  
   nanowires 397, 399, 410,  
   414, 419, 425–429  
 InP/InAs nanowires 400, 415,  
   418, 427  
 InP/InAs quantum  
   heterostructure nanowires  
   397–398, 400, 402, 404,  
   406, 408, 410, 412, 414,  
   416, 418, 420, 422, 424,  
   426, 428, 430  
 InP nanowires 365–371, 373,  
   375–376, 385, 398, 401,  
   416, 419, 426, 429  
 position-controlled 372–373  
 position-controlled growth of  
   371, 373, 375  
 site-defined 419, 427, 429  
 InP-related nanowires for  
   light-emitting applications  
   365–366, 368, 370, 372,  
   374, 376, 378, 380, 382,  
   384, 386, 388, 390  
 InP substrates 374, 384–386,  
   389, 404–406, 420  
   exposed 419–421, 423, 428  
   patterned 373, 385, 390  
 integrated circuits (ICs) 179,  
   398, 466  
 internal quantum efficiency  
   (IQE) 17–19, 44–45, 90,  
   380, 444, 446, 499–500  
 IQE, *see* internal quantum  
   efficiency  
 laser diodes (LDs) 59, 335, 446  
 lasers 3–4, 19, 93, 134, 348, 365,  
   402, 437–438, 440, 442,  
   444, 446–452, 454, 456

- vertical-cavity surface emitting  
257, 268, 274
- lasing emissions 93–94
- lattice mismatch 6, 8–10, 12,  
154, 257, 399, 417, 494
- LDs, *see* laser diodes
- LE, *see* localized exciton
- LEDs, *see* light-emitting diodes
- LEDs based on uniform  
nanocolumn arrays 86–87,  
89, 91
- light absorption 54, 122,  
492–493
- light emission 116, 118, 122,  
124, 127, 154, 156, 277,  
279, 281, 308, 381
- light-emitting applications  
365–367, 369, 372, 390
- light-emitting devices 108, 142,  
378, 381–384
- light-emitting diodes 108, 222
- light-emitting diodes (LEDs)  
3–4, 19, 32, 46–47, 56, 59,  
77, 84–86, 95, 134, 192,  
320, 335, 438, 443, 478
- light-emitting structures 371,  
378–379
- localized exciton (LE) 139–140,  
144–145, 152
- luminescence 47, 255, 274,  
380, 402, 410, 417–418,  
426–428
- magnetic force microscopy  
(MFM) 184, 201–202,  
221, 239, 242–244
- magnetic stray fields 242–244
- manganese adatoms 191,  
208–209
- surface migration length of  
178, 208–209, 212
- manganese atoms 191, 196,  
199, 204–206, 209
- MBE, *see* molecular beam epitaxy
- MBE growth 324
- MDs, *see* misfit dislocations
- metal-organic chemical vapor  
deposition (MOCVD) 7, 69,  
438
- metal-organic vapor phase  
epitaxy (MOVPE) 68, 168,  
179, 322, 337, 349, 366,  
374, 400, 476, 496–497
- MFM, *see* magnetic force  
microscopy
- misfit dislocations (MDs) 8, 10,  
65, 67, 478, 487, 494
- MnAs/GaAs hybrid  
nanowires 185
- MnAs growth 185–186
- MnAs/InAs heterojunction  
nanowires 196–197, 201,  
212
- MnAs nanoclusters 177–178
- MnAs NCs 180–181, 183–196,  
198–212
- MOCVD, *see* metal-organic  
chemical vapor deposition
- molecular beam epitaxial growth  
255, 282
- molecular beam epitaxial growth  
of GaN nanocolumns  
31–32, 34, 36, 38, 40, 42,  
44, 46, 48, 50, 52, 54, 56,  
58, 60, 62, 64, 66, 68, 70,  
72, 74, 76, 78, 80, 82, 84,  
86, 88, 90
- molecular beam epitaxy (MBE)  
7, 107–109, 134, 164–165,  
167, 171–172, 224,  
257–259, 293, 319–320,

- 322, 324, 326, 328, 330, 332, 334, 336, 338, 340, 342, 344, 346, 348, 350, 352, 354, 356, 399, 439
- MOVPE**, *see* metal-organic vapor phase epitaxy
- MQDs**, *see* multiple quantum disks
- MQWs**, *see* multiple-quantum wells
- multiple quantum disks (MQDs) 32, 36, 42–43, 56
- multiple-quantum wells (MQWs) 42, 79, 84, 87–88, 91, 93
- nanocolumn emissions 53, 83
- nanocolumn growth 35–36, 40, 71–72
- nanocolumn LEDs 32, 46, 48–49, 51–55, 60–61, 86, 88, 90–91
  - multi-color 47–48
- nanocolumn photonic crystal effect 93
- nanocolumn photonic crystals 32, 92, 94, 96
- nanocolumns, self-organized 49, 55, 57, 75
- nanodots 69, 71–72
- nanoholes 73–74, 76, 324–326
- nanowire arrays 8, 20
- nanowire devices 6, 14, 19
- nanowire heterostructures 3, 5, 11, 13–15, 17–20, 367, 438
  - epitaxial 3, 5–6
- nanowire hierarchical structure 453
- nanowire LEDs 19, 447–448, 457
- nanowire light-emitting structures on Si substrates 384–385, 387, 389
- nanowire surface, uncontrolled oxidation of 296–297, 301
- nanowires
  - composite 255
  - individual GaAs/GaNAs 145
  - p-GaN 447, 455
- Neel-temperature 239
- neurons 466, 468–469
- nitrogen 77, 107, 112, 128, 133, 148, 150
- nitrogen flow rate 33–34, 67, 75–76, 78
- non-polar crystal planes 325
- nucleation 6, 56, 69, 73, 76, 213, 324, 326, 331–332
- initial 172, 323–324, 331–332
- spontaneous 32, 72, 74–76
- NW-FETs**
  - lateral 467, 469, 471
  - vertical 467, 470–471
- optoelectronic devices 3–5
- p-type shell growth 379
- PAS**, *see* photoacoustic spectroscopy
- photo-generated carriers 148–149, 492, 494
- photoacoustic spectroscopy (PAS) 171
- photoluminescence (PL) 14, 36, 43–44, 111, 124, 127, 139, 141, 145, 274, 277, 279–283, 308, 371, 389, 401, 440, 442, 477

- photonic crystal effect 32, 90, 93, 258, 271
- photovoltaic applications 437–438, 440, 442, 444, 446, 448, 450, 452, 454, 456–457, 465–466, 468, 470, 472, 474, 476–478, 480, 482, 484, 486, 488, 490–492, 494, 496, 498, 500, 502
- photovoltaic devices 465–466, 491, 493, 495, 497, 499, 501
- PL, *see* photoluminescence
- PL efficiency 45, 147
- PL emission 122, 125, 138, 143
- PL intensity 18, 114–116, 122, 149, 152–153, 280–281, 380, 389
- polytypism 16, 116–117, 119, 121
- position-controlled InP nanowires, growth of 373
- QCSE, *see* quantum-confined Stark effect
- QDs, *see* quantum dots
- quantum-confined Stark effect (QCSE) 49, 79, 444
- quantum confinement effect 150, 155, 415–417, 426, 428, 441–442, 472
- quantum dots (QDs) 15, 150–151, 154–155, 335–336, 344–345, 366, 370–371, 446
- quantum light emitters 321, 335–337, 339, 341, 343, 345, 357
- radial heterostructures, two-dimensional array of 377
- radio-frequency-plasma-assisted molecular beam epitaxy (RF-MBE) 31, 33, 39–40, 45, 57, 60, 68–69, 73–74, 78, 81, 84, 86
- reactive ion etching (RIE) 192, 338, 349, 382, 484–485
- reservoir effect 9–10, 410, 414
- RF-MBE, *see* radio-frequency-plasma-assisted molecular beam epitaxy
- RF-MBE growth behavior of GaN nanocolumns 37
- RIE, *see* reactive ion etching
- SAG, *see* selective-area growth
- SAG GaN nanowires 332–334
- SAG homoepitaxy 323–324, 330, 332, 357
- SAG MBE 336, 338–339
- SAG of GaN nanocolumns 68, 73–74, 86
- sapphire 4, 37–40, 84–85, 90, 321, 450
- scanning electronic microscopy (SEM) 33, 109, 118, 136, 181, 184, 186–187, 192–193, 196, 201, 226, 235, 240, 259, 277–278, 295, 324, 333, 368, 400–402, 410, 440
- SCs, *see* solar cells
- selective-area growth (SAG) 32, 54, 68–70, 72–74, 76, 86, 183, 319, 321, 325–326, 328, 330, 332, 334, 398,

- 407, 465–467, 476,  
478–479, 482, 488, 492
- self-catalyzed GaAs nanowires  
291
- self-catalyzed growth 385, 407
- self-catalyzed VLS 399, 403,  
405–407, 410, 412
- self-organized GaN nanocolumns  
32–33, 35–37, 39, 41, 58,  
96
- self-organized nanocolumn  
LEDs 42–43, 45, 47, 49,  
51, 53, 55, 57, 59, 61
- SEM, *see* scanning electronic  
microscopy
- semiconducting nanowire  
templates, selective-area  
growth of 182
- semiconductor heterostructures  
3–4, 12
- semiconductor nanowires  
170–171, 291, 397–398  
energy gap of 161, 173
- SGT, *see* surrounding-gate  
transistor
- Si-doped n-type GaAs 178,  
194–195, 211
- Si-MOSFETs 474–475, 490
- silicon 191, 198–199, 203, 292,  
321, 439, 449, 465
- single photon sources (SPSs)  
320, 323, 335–337, 339,  
344, 357, 367
- single-quantum-disk (SQD) 44,  
51, 53
- $\text{SiO}_2$  57, 60, 69, 182, 196, 294,  
373, 407, 439, 453, 476, 479
- $\text{SiO}_2/\text{Si}$  interface 479
- $\text{SiO}_2/\text{Si}$  substrates 58, 184, 402
- solar cell devices, single  
InGaN/GaN core-shell  
nanowire 455
- solar cells (SCs) 17, 59, 142, 256,  
283, 429, 452, 478, 488,  
491–492, 494, 501
- spintronics 221–222, 245
- SPSs, *see* single photon sources
- SQD, *see* single-quantum-disk
- $\text{SrTiO}_3$  291, 293, 302–307, 309
- $\text{SrTiO}_3$  growth 291, 293, 303,  
305–309
- $\text{SrTiO}_3$  shell 291, 302, 308–309
- structural characterizations 181,  
184, 189, 191, 200, 211
- surrounding-gate transistor  
(SGT) 321, 470–472,  
474–475, 478, 483–485,  
490
- TBA, *see* tertiarybutylarsenic
- TBP, *see* tertiarybutylphosphine
- TEM, *see* transmission electron  
microscopy
- tertiarybutylarsenic (TBA) 400,  
404
- tertiarybutylphosphine (TBP)  
400
- TFETs, *see* tunnel field-effect  
transistors
- thin-film devices 366
- transmission electron  
microscopy (TEM) 37, 47,  
117, 136, 150, 181, 184,  
188, 198, 201–202, 211,  
221, 227–229, 235, 259,  
300, 310, 334, 369, 400,  
405, 440
- tunnel field-effect transistors  
(TFETs) 13
- twin defects 165, 211
- two-terminal devices, fabrication  
of 193

- UHV, *see* ultrahigh vacuum  
ultrahigh vacuum (UHV) 293,  
297, 299, 301–303, 308,  
479
- VLS (vapor–liquid–solid) growth  
7, 11, 373
- VLS growth, self-catalyzed 385,  
398, 407
- VLS growth mode 385, 398
- VLS growth of InP nanowires  
376, 385
- VLS mode, indium-particle-  
catalyzed 399, 408, 411,  
419
- ZB  
*see* zinc blende  
pure 136–137, 150–151, 153
- ZB crystalline structure 404–405
- zinc blende (ZB) 58, 116, 118,  
120–121, 136, 148,  
153–154, 295, 369, 371
- Zn-doped p-type GaAs 178,  
192–194, 211



*“After more than a decade of intensive research, this book reviews key aspects of and results on semiconductor nanowires. Many highly accomplished researchers of the field provide comprehensive overviews, covering the growth of nanowires in various material systems and discussing their potential for applications in unique one-dimensional devices. A highly useful and inspiring reference for students and advanced researchers alike, most timely at the point when nanowires are set to prove their usefulness in nanotechnology.”*

**Prof. Dr. Henning Riechert**

Paul-Drude-Institut für Festkörperelektronik, Germany

*“This is an outstanding book on novel compound semiconductor nanowires. It covers a broad spectrum of materials, including nitrides, diluted semiconductors, and traditional III–V semiconductor nanowires, and discusses their synthesis and characterization and devices based on them. The book is an excellent reference for people working in the field and newcomers who want to learn about the nanowires of novel semiconductors. I congratulate the editors and the authors for producing this book.”*

**Prof. Chennupati Jagadish**

Australian National University, Australia

Impressive developments of molecular beam and metalorganic vapor phase epitaxy have led to the realization of high-quality, single-crystalline III–V heterostructure nanowires with precisely controlled properties on the atomic scale. Due to high mobility and superior optical performance, such nitride-, phosphide-, and arsenide-based nanowires are considered among key materials for the next-generation nanoscale photonic and electronic devices, including highly efficient light emitters and solar cells, as well as high-speed transistors. The device functionality can be further extended by utilizing highly mismatched alloys formed from III–V compounds with a large miscibility gap or by the formation of hybrid nanowire heterostructures between III–V semiconductors and magnetic half-metals and oxides. This book reviews the recent progress of such novel nanowire systems and covers a wide range of aspects ranging from epitaxial growth to device applications.



**Fumitaro Ishikawa** received his PhD in electronic engineering in 2004 from Hokkaido University, Japan. From 2004 to 2006, he worked in Paul-Drude-Institut für Festkörperelektronik, Germany. In 2007, he became an assistant professor at Osaka University, Japan. Since 2013, he is an associate professor at Ehime University, Japan. Prof. Ishikawa has worked on the molecular beam epitaxy of compound semiconductors throughout his career. His current research interests focus on the synthesis of advanced materials based on compound semiconductor nanostructures.



**Irina A. Buyanova** received her PhD in solid-state physics in 1987 from the Institute for Semiconductors, Ukrainian Academy of Sciences, Kiev. In 1994, she joined the Department of Physics, Chemistry and Biology at Linköping University, Sweden. In 2002, she was awarded a senior researcher grant of excellence from the Swedish Research Council followed by a professorship at Linköping University in 2007. Prof. Buyanova's current research interests focus on the physics and applications of novel spintronic materials, advanced electronic and photonic materials based on wide-bandgap semiconductors and highly mismatched semiconductors, and related nanostructures.

V560  
ISBN 978-981-4745-76-5

9 789814 745765