

## Index

### a

acetylene 156  
 AlCN nanocomposite: tailoring composition 246  
 AlN buffer interlayer 168  
 AlN nanostructures: fabrication 162  
 AlN: properties 163  
 amorphous silicon 20  
 anisotropic selective etching 274  
 Ar+H<sub>2</sub> plasma 182  
 Ar+H<sub>2</sub>+C<sub>2</sub>H<sub>2</sub> plasma 156  
 Ar+H<sub>2</sub>+CH<sub>4</sub> plasma 124, 137  
 Ar+N<sub>2</sub>+CH<sub>4</sub> plasma 245  
 Ar+N<sub>2</sub>+H<sub>2</sub> plasma 168  
 Ar+O<sub>2</sub> plasmas 271  
 argon X  
 Atomic Force Microscopy (AFM) 221  
 atomic force microscopy (AFM) 165

### b

Bohm sheath criterion 11  
 Bohm velocity 11  
 Boltzmann's relation 10  
 building units 19, 33, 82, 266, 272

### c

calcium phosphate CaP 225  
 calcium titanate (CaTiO<sub>3</sub>) 226  
 carbon nanotips 121, 126, 132  
 carbon nanotips, single-crystalline 137  
 carbon nanotips: field emission properties 134  
 carbon nanotips: hydrogen termination 144  
 carbon nanotips: temperature-controlled growth (TCG) regime 130  
 carbon nanotube microemitters 26  
 carbon nanotubes X, 2, 19  
 carbon nanotubes: doping 153  
 carbon nanotubes: multiwalled XI, 15  
 carbon nanotubes: single-walled XI, 15  
 carbon nanotubes: vertical alignment 276

carbon nanowall-like structures (CNWLS) 156  
 carbon pyramid-like structures (CPLS) 126, 128  
 carbon-based nanostructures 25  
 charge neutrality 6  
 charged cluster theory 270  
 clustering in a plasma 271  
 conduction band 147, 159  
 cross-sectional SEM 255, 262  
 crystalline Si nanoparticles 22

### d

dangling bonds 18  
 DC substrate bias X  
 Debye length 10  
 Debye shielding 9  
 defect of mass 1  
 density functional theory (DFT) 142  
 discharge mode transitions:  $E \leftrightarrow H$  99  
 discharge mode transitions:  $D \leftrightarrow M$  111  
 discharge mode transitions:  $E \leftrightarrow H$  51, 54, 66  
 discharge mode transitions: self-transition 101  
 discharges in gas mixtures: control of excited species 72  
 DMol<sup>3</sup> package 142  
 dusty (complex) plasma 20

### e

EDX spectroscopy 256  
 electron energy distribution/probability functions (EEDF/EEPF) 246  
 electron field emission 146  
 electron temperature 5  
 energy bandgap 147

### f

Fermi energy level 146  
 floating temperature regime X  
 Fowler-Nordheim tunneling 146  
 FTIR spectroscopy 187, 196, 249

**g**

GaN nanorod LEDs 274  
 gas discharge 3  
 gas separation 264  
 gas temperature 5  
 germane 29

**h**

hexamethyldisiloxane (HMDSO) plasma 265  
 High-Resolution TEM (HRTEM) 137, 154, 189, 205, 243  
 highest occupied molecular orbitals (HOMO) 147  
 hydrogen X  
 hydroxyapatite 272  
 hydroxyapatite: biomimetic response 233  
 hydroxyapatite: chemical formula 210  
 hydroxyapatite: crystallinity 219  
 hydroxyapatite: cytocompatibility assessment 233  
 hydroxyapatite: fabrication methods 212  
 hydroxyapatite: growth scenario 225  
 hydroxyapatite: microscratch test 226  
 hydroxyapatite: process optimization 217  
 hydroxyapatite: SBF *in vitro* assessment 230  
 hydroxyapatite: surface morphology 221

**i**

ICP discharge: equivalent circuit 45  
 ICP plasma sources 44, 50  
 ICP-DC magnetron hybrid discharges 114  
 ICP: discharge hysteresis 54  
 ICP: EEDF/EPPF measurements 47  
 ICP: electron temperature 52, 78, 95  
 ICP: Langmuir probe diagnostics 47, 67, 95  
 ICP: magnetic probe diagnostic 46  
 ICP: nonlinear electromagnetic fields 57  
 ICP: nonlinear Lorentz force 62  
 ICP: plasma density 52, 78, 95  
 ICP: plasma potential 52, 95  
 ICP: RF circuit diagnostic 46  
 ICP: RF power deposition 87  
 ICP: second-harmonic generation 57, 61  
 ICP: two-dimensional fluid model 72  
 inductively coupled plasma (ICP) XI, 41, 81, 86  
 Integrated Plasma-Aided Nanofabrication Facility (IPANF) XI, 116, 199, 253  
 IOCPs plasma source 87  
 IOCPs: operating pressure range 97  
 IOCPs: plasma uniformity 95  
 ion bombardment X, 33, 266

ion fluxes X, 27  
 ion temperature 5  
 ionization 3  
 ionization degree 5  
 ITER 1

**l**

liquid precursor feed system 117  
 local-density approximation (LDA) 142  
 low-temperature plasma 32  
 lowest unoccupied molecular orbitals (LUMO) 147  
 luminescent Si nanoparticles 24

**m**

methane X  
 molecular sieve membranes 265  
 multistability of plasma discharges 114

**n**

nano-/microporous membranes 264  
 nano-pyramids XI  
 nano-scale IX  
 nanoassembly XI  
 nanoassembly: chemical purity 16  
 nanoassembly: cohesive energy 144  
 nanoassembly: controlled BU supply 278  
 nanoassembly: elemental composition 15  
 nanoassembly: plasma substrate heating 278  
 nanoassembly: precursor dissociation in plasmas 278  
 nanoassembly: reactivity 17  
 nanoassembly: size 14  
 nanoassembly: stoichiometry 16  
 nanoassembly: structural stability 144  
 nanoassembly: structure 15  
 nanoassembly: shape 15  
 nanocantilevers 275  
 nanocluster charge 271  
 nanocluster-assembled crystalline TiO<sub>2</sub> 270  
 nanoclusters 18  
 nanocones XI  
 nanocrystalline AlN: columnar structure 255  
 nanocrystalline AlN: plasma-controlled properties 257  
 nanocrystalline AlN: stoichiometry 256  
 nanocrystalline V<sub>2</sub>O<sub>5</sub>: main features 263  
 nanocrystalline V<sub>2</sub>O<sub>5</sub>: plasma-controlled properties 258  
 nanocrystalline V<sub>2</sub>O<sub>5</sub>: Raman fingerprints 259  
 nanocrystals 2  
 nanofabrication 2, 19  
 nanofibers XI

- nanoparticle superlattices: SiCN/AlN 192
- nanoparticles 2, 14, 20
- nanoparticles: carbon 25
- nanoparticles: plasma synthesis 278
- nanoparticles: titanium dioxide 25
- nanopatterns/arrays 2
- nanopatterns: size and shape uniformity 18
- nanorod-to-nanowire transformation 206
- nanorods: SiCAlN 205
- nanorods: SiCN 206
- nanoscience 12
- nanostructure dimensionality XI, 160
- nanostructure reshaping 28
- nanostructure synthesis X
- nanostructured films 2
- nanostructured films: AlCN 245
- nanostructured materials 20
- nanostructured surfaces X
- nanostructures 2
- nanostructures: dimensionality 29
- nanotechnology 2, 12
- nanowires: *a*-SiO<sub>2</sub> 189
- nanowires: SiCN 30, 206
- Ni/Fe/Co catalyst X
- Ni/Fe/Co catalysts: thermal fragmentation 123
- nonequilibrium plasmas 32
- nuclear fusion 1
- o**
- Optical Emission Spectroscopy (OES) 48, 63, 99, 156, 218, 249
- optical microscopy 233
- Ostwald ripening 166, 183
- p**
- Pauli's exclusion principle 146
- PEMSF: discharge hysteresis 115
- photoluminescence (PL) 169, 170, 175, 192, 196, 200
- photoluminescence (PL): doping induced 239
- photovoltaic applications 20
- plasma applications 1
- Plasma Assisted Magnetron Sputtering Deposition (PAMSD) 203, 213, 238, 245, 259
- plasma density 7
- plasma discharges: boundary conditions 76
- plasma discharges: ionization and excitation rates 75
- plasma discharges: particle and power balance 75
- Plasma Enhanced Chemical Vapor Deposition (PECVD) 29, 124, 130, 137
- plasma environment X
- Plasma Nanoscience XII
- plasma nanotools XII
- plasma requirements for nanofabrication 35
- plasma sheath 9
- plasma source XI
- plasma sources: requirements 3, 42
- plasma state 1
- Plasma-assisted magnetron sputtering deposition (PAMSD) 263
- Plasma-Assisted Magnetron Sputtering Deposition (PAMSD) 162, 169
- plasma-assisted RF magnetron sputtering 29
- plasma-enhanced magnetron sputtering 109
- Plasma-Enhanced Magnetron Sputtering Facility (PEMSF) 108
- plasma-enhanced nanolithography 274
- plasma: definition 3
- plasma: partially and fully ionized 5
- polymorphous nanomaterials 22, 242
- q**
- Quadrupole Mass Spectrometry (QMS) 49, 116
- quantum confinement structures XI
- quantum dots: Al<sub>x</sub>In<sub>1-x</sub>N/AlN/Si 168, 169
- quantum dots: AlN/Si 165
- quantum dots: crystallinity 165
- quantum dots: GaN/Al<sub>x</sub>Ga<sub>1-x</sub>N 275
- quantum dots: Ge/Si 29
- quantum dots: Ge/SiO<sub>2</sub> 275
- quantum dots: growth modes 175
- quantum dots: Si/AlN 199
- quantum dots: SiC 29
- quantum dots: SiC, effect of AlN buffer layer 177
- quantum wells: SiC-AlN 174
- r**
- Raman spectroscopy 127, 139, 167, 259
- s**
- Scanning Electron Microscopy (SEM) 124, 131, 156, 164, 169, 177, 183, 189, 204–206, 220, 224, 230, 233, 254, 262
- Scanning electron microscopy (SEM) 137
- Scanning Transmission Electron Microscopy (STEM) 170, 180
- Scherrer's equation 165, 223
- semiconductors: acceptor atoms 150

- semiconductors: donor atoms 150
- semiconductors: Group III nitride 161
- semiconductors: n-type 150
- semiconductors: p-type 150
- Si nanopillar arrays 274
- SiC nanoassemblies: fabrication techniques 173
- SiC nanoparticle films: Er doping 239
- SiC quantum dots: crystallinity 185
- SiC quantum dots: pattern uniformity 184
- SiC quantum dots: plasma process control 187
- SiC quantum dots: stoichiometry 185
- SiC: properties 172
- silane plasma 20
- Simulated Body Fluid (SBF) 230
- size-dependent properties 14
- skin effect 89
- substrate heating XI
- superhard  $nc\text{-Al}_x\text{Ti}_{1-x}\text{N}/a\text{-Si}_3\text{N}_4$  nanocomposite 273
- surface passivation 18
- surface temperature X
- surface-to-volume ratio 17
  
- t**
- thermal plasma spraying 212
- thermal plasmas 6, 32
- Ti–Si–N–O barrier alloys 242
- Ti6Al4V orthopedic alloy 210
  
- TiCl<sub>4</sub>+O<sub>2</sub> plasma 272
- Transmission Electron Microscopy (TEM) 189, 193, 201
- tricalcium phosphate (TCP) 232
  
- u**
- ULSI technology 2
- ultrananocrystalline diamond 24
- US National Nanotechnology Initiative 12
- UV/Vis spectrophotometry 261
  
- v**
- valence band 147, 159
- Van der Waals bonding 148
- vertical alignment X, 26, 136
  
- w**
- work function 146
- working units 33
  
- x**
- X-ray Diffractometry (XRD) 127, 220, 222, 231, 253
- X-ray diffractometry (XRD) 239, 254, 262
- X-ray Photoelectron Spectroscopy (XPS) 184, 218, 255, 261
- X-ray reflectivity (XRR) 194
  
- z**
- ZnO nanorods 28