

Index

- 1D METFET 29, 32
- ab initio 90
- acid treatment 135
- acoustic phonon 90
- advances in carbon nanotube characterization 151
- AFM cantilevers, calibration 321
- ambipolar 238, 246, 247
 - conduction 232, 236, 240
 - FET behavior 143
- anion-exchange chromatography 256
- axial phonons 107
- azimuthal mode 106
- ballistic transport 242
- bamboo nanotubes 289
- band
 - assignation 53
 - degeneracy 53
 - electron 54
 - p^\perp 55
 - DFTB 57
 - gap 4, 26–30, 33, 229, 237
 - modulation 141
 - phonon 69
 - topology 52
 - structure 228
 - engineering 25
- Bardeen ansatz 98
- bearings, nanoscale 286
 - friction 288
- boron nitride nanotubes 273, 299–302
 - electrical conduction 302
 - electron field emission 300
- boundary condition 91, 103
- breathing mode 94
- buckyball 109
- bulk switching 235
- C_1, C_2 constants for inner tubes 217
- C_{60} polymer 146
- C_{80} nano-peapods 138, 140
- C_{82} nano-peapods 135, 140
- capillarity 133
- carbon nanocoil 322
- carbon nanocoil, mechanical properties 322
- carbon nanotube, tensile loading 320
- carbon nanotubes 273
 - bamboo structures 289
 - bearings 286
 - friction 288
 - constant force spring 286
 - electrical failure 278
 - kinking and collapsing 291, 298
 - peeling and sharpening 281
 - phase coherence 297
 - rheostat, or variable resistor 291, 297
 - telescoping 283
 - Van der Waals forces 285, 286
- carrier interaction 98
- changes to the Raman spectrum 174
- charge trapping 332
- chemically prepared DWCNTs 210
- Chiral indices of inner tubes 217
- Chiral index assignment for inner tubes 217
- chiral vector 43
- CNT-FET 231, 232
 - device preparation 267
 - sensor 267
- collapsing nanotubes 291, 298
- comparison of chemically prepared and peapod derived DWCNTs 210
- conductance 229

- conduction band 141
- constant force spring 286
- contact resistance 232, 233
- continuum model 90
- corrugation 84

- Debye screening length 4, 5, 29
- deep reactive ion etching (DRIE) 315
- deformation 97
- device fabrication 113
- devices from long nanotubes 129
- DFT calculated DOS of small inner tubes 212
- DFT refined small tube diameters 217
- diameter control 114
- diameter control using nanocluster molecules 116
- diameter distribution of DWCNTs 206
- diameter selective growth monitored in DWCNTs 207
- discovery of DWCNTs 206
- dispersion 94
- divergence 97
- DNA-assisted dispersion and separation 254
- DNA-CNT 254
 - binding energy 263
- Donnell's equation 90
- double-wall carbon nanotube 146
- Drift-Diffusion 6
- DWCNT electronic structure 211
- DWCNT inner tubes and small HiPco tubes comparison 215
- DWCNT sample preparation 205
- DWCNT synthesis 206
- DWCNT synthesis followed with Raman 207

- EELS 139
- effect of cytc-CNT binding on electron transport 268
- elastic scattering 229, 230
- electrical conduction
 - in boron nitride nanotubes 302
- electrical failure of nanotubes 278
- electroluminescence 247
- electron beam induced decomposition (EBID) 312, 317
- electron diffraction 137
- electron field emission
 - from boron nitride nanotubes 300
- electrostatics of DNA/CNT hybrid 264
- energy dispersive Raman studies on DWCNTs 211
- exciton 244, 245

- fast-heating CVD 119
- field effect transistor (FET) 5, 142, 227, 228, 231
- field emission
 - from boron nitride nanotubes 300
- filling yield 136
- force constants 57
 - modifications 58
- force-constant model 90
- fullerene 90

- gate dielectric 233
- gate dielectric 231–233, 238
- Gd M₄₅ edges 139
- graphene 228
- Green's function 15–17
- group
 - breaking 81
 - helical 44
 - isogonal 44
 - line 43, 48
 - point 44
 - projector 50
 - roto-translational 44, 47
- growth mechanism of long nanotubes 122

- Hamiltonian 98
- Helmholtz equation 102

- ice nanotube 148
- inelastic scattering 230
- inner-outer vs. tube-tube interaction in bundles 215
- interfacial shear strength (IFSS) 323
- interfacial strength, nanotube-polymer composites 323
- intermolecular distance 137
- inverter 243, 244
- ionic displacement 102
- IR emission 247

- Kataura plot for DWCNTs 211
- Kelvin probe 241
- kinking nanotubes 291, 298

- La M₄₅ edges 140
- Landauer, R. 295
- light emission 248
- local density of states 141
- local gate 29, 34–36, 339
- local gating 30
- localization theory 295–297
- logic 243, 244
- Long nanotubes 120
- low temperature synthesis of peapods 209
- low-temperature STM and STS 141

- macroscopic synthesis of DWCNT 206
- manning condensation on DNA-CNT 264
- mechanical properties of nanotubes 276
- mechanical properties, resonance methods 328
- mechanical properties, tensile loading 318
- mechanics of nanostructures 307
- MEMS-based testing stage 315
- metal-semiconductor transition 30, 32
- metallic field-effect transistor (MET-FET) 29, 30, 34–36
- microdelivery system, components 313
- microdelivery system, design requirements 311
- microdelivery system, precursor compounds 313
- microdelivery system, sample clamping 311
- mobility 230, 242
- mode
 - acoustic 68
 - breathing like 78
 - high energy 71, 78
 - IR active 71
 - optical 70
 - radial breathing 69
 - Raman active 71
 - rigid layer 76
- molecular dynamics simulation 136
- monomer 44
- MOSFET 227
- multi wall nanotube 90
- multifrequency Raman spectroscopy 205
- multiscale approach 5, 6
- MWNTs, “sword-in-sheath” failure 325

- nano-reactor 145
- nanomanipulation 277–302
- nanomanipulators 309
- nanomechanics, sample attachment 311
- nanoscale bearings 286
 - friction 288
- nanoscale rhesostat 291, 297
- nanostructures, *in situ* clamping 312
- nanotube 89
 - bamboo structures 289
 - boron nitride 273
 - bearings 286
 - friction 288
 - boron nitride 299–302
 - electrical conduction 302
 - electron field emission 300
 - carbon 273
 - constant force spring 286
 - electrical failure 278
 - kinking and collapsing 291, 298
 - mechanical properties 276
 - peeling and sharpening 281
 - phase coherence 297
 - rheostat, or variable resistor 291, 297
 - telescoping 283
 - Van der Waals forces 285, 286
- nanotube classes, double wall carbon nanotubes 204
- nanotube polymer composites 323
- nanotube pullout tests 323
- nearly free-electron states 141

- OFF current 36
- OFF state 29, 237
- OFF/ON current ratio 35, 339

- OFF/ON ratio 34, 35
 ON conductance 29
 ON current 32, 35
 ON state 29, 32
 on-state 237
 optical absorption 60
 optical mode 102
 optical phonon 90
 optoelectronics 246
 orbit 50
 orientation control 118
 output characteristics 233
 overbending 73
 oxygen on nanotubes 259
- peeling nanotubes 281
 phase coherence in nanotubes 297
 phonon 89, 229, 230
 frequency 103
 scattering rate 109
 velocity 103
 photoconductivity 246
 photocurrent 246
 photoluminescence 244
 photovoltage 246
 polymer interphase, adhered layer 325
- Q* factor 331
 quantization 92
 quantum capacitance 11, 16, 18, 22
- radial breathing mode 135
 RBMs of inner tubes 207
 resonance Raman on DWCNTs 213
 resonance, *ac* electric field-induced 329
 rheostat, nanoscale 291, 297
 ring oscillator 244
- scaling 241, 242
 scattering 229, 230
 Schottky barrier 230, 235–237, 239, 240
 screening 16, 29
 screening of charge by nanotube core in DNA-CNT 265
 selection rules 53, 61
 selective covalent chemistry of single-walled carbon nanotubes 153
 selective non-covalent chemistry: charge transfer 164
 selective non-covalent chemistry: solvatochromism 170
 selective protonation of single-walled carbon nanotubes in solution 164
 selective protonation of single-walled carbon nanotubes suspended in DNA 169
 self-consistent 12, 13, 15–18, 21, 22
 separation according to electronic properties 114
 separation by non-ionic surfactants 258
 sharpening nanotubes 281
 silica nanowires, mechanical behavior 330
 single wall nanotube 90
 Sm M_{45} edges 146
 sound velocity 69
 spectroscopic tools for understanding selective covalent chemistry 160
 splitting 18, 19, 21–25
 splitting of DWCNT RBMs 214
 spontaneous symmetry breaking 25
 ssDNA, single-stranded DNA 254
 stimulated symmetry breaking 30
 structure of DNA/CNT hybrid 262
 subthreshold slope 231, 233, 236, 242
 subthreshold slope 236
 switching mechanism 235
 symcell 49
 symmetry breaking 18, 33
 Synthesis of nano-peapods through gas phase reaction 134
 synthesis of nano-peapods through liquid phase reaction 137
- telescoping nanotubes 283
 TEM on DWCNTs 206
 tensile loading, nanostructures 318
 the effect of inner-outer tube interactions 214
 the pyramidalization angle formalism for carbon nanotube reactivity 154

- the selective covalent chemistry of
 - single-walled carbon nanotubes 155
- thin film transistors 234
- Thouless, D.J. 295
- threshold voltage 233, 240
- tight binding calculation 107
- top-gate 232, 233
- transconductance 7, 9, 231–233, 242
- transfer characteristics 234, 238
- transfer characteristics 233
- transistor 231
- transmission electron microscopy 273–302
- tunneling 236
- two-dimensional nanotube networks 122
- uniform electric field 26
- valence band 141
- Van der Waals forces 285, 286
- Van Hove singularities in DWCNTs 213
- Van Hove singularity 141
- variable resistor, nanoscale 291, 297
- vibrational resonance measurements 328
- $W(\text{CO})_6$ 313
- wave vector 94
- wavelength shifts 171
- weak screening 4, 5
- width of Van Hove singularities 213
- X-ray diffraction 136
- zone folding 90