

Index

a

acidic polymers 182
 adenosine triphosphate 129, 130
 adsorbed photon-to-current efficiency (APCE) 350, 351
 agarose gel shift assay 330
 amidinium–carboxylate interaction – supramolecular dyad based 33
 ammonium cation/crown ether self-assembly – SWNT-porphyrins/SWNT-fullerene hybrids 275
 ammonium–crown ether motifs 42
 ammonium-functionalized CNTs, structural representation 330
 amphiphilic C₆₀ derivatives, biological activities 159
 amphiphilic macromolecules 161
 arene/arene distances 59
 aromatic macrocycles 277
 artificial helical nanotube 177
 aryl diazonium salts 17
 arylmagnesium bromide derivatives 230
 association constants 376, 384 – determination 389
 atomic absorption spectroscopy (AAS) 329
 atomic force microscopy (AFM) technique 237, 265
 azacalix[3]arene[3]pyridine 60
 azacalix[n]arenes 61
 azacrown ethers, lipophilic cavity of 56
 azomethine ylides – 1,3 dipolar cycloaddition 15, 303, 310

b

barbiturate-coated gold surface – linear ADA triads deposition 45
 barbiturate-labeled electron acceptor fullerene 362

BC₂

– and an ammonium derivative lacking 88
 – chemical structure of 86
 – π-conjugated system of 95
 – stability constants 87
 Benesi-Hildebrand plot 149
 benzonitrile 36
 benzylamine 17
 bicontinuous donor–acceptor arrays 363
 binding constants 375, 381, 385
 binding isotherm 376, 377, 379, 380, 387, 388
 Bingel reaction 17
 Bingel-type C₆₀-cycloadduct 28
 bioinspired nanotubular cyclopeptidic heterodimers 44
 biological redox processes 317
 biomimetic bacterial photosynthetic reaction 37
 biomolecules, facile immobilization 276
 bis-benzo-18-crown-6-appended porphyrins 37
 bisporphyrin cleft molecule 198
 bisporphyrin macrocycle 198
 5,15-bis(4-pyridyl)-porphyrin – spontaneous complexation 278
 bis(zinc porphyrin)–fullerene supramolecular triad 35
 bovine serum albumin proteins (BSA) 314
 BTEX -S 320
 buckyferrocenes 228
 bulk heterojunction (BHJ) devices – active layer of 46
 – solar cells 47
 – used in 47
 bulk heterojunction solar cells 359, 360, 364
 buoyant density 268
p-*tert*-butylcalix[5]arene 175
p-*tert*-butylcalix[8]arene 57

c

- C₆₀-acridine-9-carboxylic acid (ACA) 253
- calix[4]arene 174
- calix[5]arene 58, 62, 63
 - schematic molecular models of 58
- calix[6]arene 60
- calixarene-based fullerene receptors 58
- calix[4]arene complexes, schematic molecular models of 58
- calix[5]arene derivatives 62
- calix[6]arene derivatives 59
- calix[5]arene dimer 62
- calixarene receptors 57
- calix[5]arenes 175
- calixarenes, association constants 58
- calix[4]naphthalene 59
- calix[n]arenes 55, 56
- calix[1]pyrreno[3]pyrrole 61
- calix[4]pyrrole derivatives 61
- C₆₀-aniline-linked dyad 355
- carbohydrate-modified CNTs 334
- carbon allotropes 334
 - applications 203
 - carbon-free energy sources 127
 - carbon nanorings 68
 - ring-in-ring complexes of 71
 - carbon nanostructures 1
 - carbon nanotubes 9
 - defect functionalization 11–13
 - sidewall functionalization 13–16
 - fullerene-containing polymers 2–10
 - graphenes 16
 - covalent functionalization 17
 - noncovalent functionalization 17–20
 - carbon nanotube field-effect transistors (CNT-FETs)
 - characteristics 275
 - fabrication 274
 - sensitivity advantage 274
 - carbon nanotubes (CNTs) 1, 10, 283, 317–334, 350, 363–366
 - applications 321
 - association 280
 - at biological interface 327–334
 - dispersion 276
 - functionalization 263, 264
 - defect 11–13
 - sidewall 13–16
 - functional structures 13
 - gas phase method 283
 - at gas–solid interface 325–327
 - high aspect ratio structure 331
 - at liquid–liquid interface 317–320
 - liquid phase method 283, 284
 - noncovalent modification of 11
 - one-dimensional wire structures 350
 - oxidation of 11
 - photothermal conversion indicator 170
 - processing 263
 - properties 302
 - at solid–liquid interface 320–324
 - sp² framework 263
 - supercritical phase method 283, 284
 - supramolecular carbon nanotube hybrids 264–288
 - supramolecular chemistry 263–288
 - at interfaces 301–335
 - supramolecular ensembles
 - applications 349–368
 - water-soluble 14
 - carbon networks 312
 - catenanes 107. *See also* rotaxanes
 - bistable 109
 - dyads assembled by metal coordination 112
 - fullerenes 110
 - synthesis from pseudorotaxane 114
 - synthetic strategies 108, 109
 - templated synthesis of 109
 - cavitand 59
 - π cavity 55
 - cavity of hosts, diameters 70
 - C₆₀-based rotaxane, chemical structures of 29
 - C₆₀-bissadduct 180
 - macromolecular helicity induction 181
 - C₆₀–CNT hybrids, types of 10
 - CDCl₃
 - ¹H NMR spectra 94, 97
 - ring-in-ring complexes, thermodynamic parameters of 71
 - C₆₀–D dyads, preparation of 40
 - CdSe–SWNT composites 367
 - cell–cell interactions 301
 - cetyltrimethylammonium bromide (CTAB) 18
 - C₆₀–exTTF–C₆₀ supramolecular triad 43
 - C₆₀ FET, schematic presentation 367
 - C₆₀–f–SWNTdevice 366
 - charge transfer processes 238
 - chelate cooperativity 91
 - binding of divalent
 - ligand AA to divalent receptor BB 91–95
 - ligand AC to complementary receptor BD 95–98
 - general principle 88–90
 - chelate cooperativity, assessment of 88
 - chiral amplification 226
 - chiral supermolecule, helical structure 226
 - chiral (6,5)-SWNTs, representation 279

- cholesterol-appended C₆₀ gelator 166, 167
 (2'-C₆₀)Ir(CO)Cl supramolecular polymer 175
 circular dichroism (CD) 135, 177
 – based polyrotaxane 186
 – of nanotube solutions 280
 cisplatinum derivative 328
 close-packed hexagonal islands
 formation 243
 close space sublimation 129
 CNTs. *See* carbon nanotubes (CNTs)
 C₆₀-oligophenylene vinylene (OPV) 40
 – covalent fullerene 40
 CoMoCat carbon nanotubes, chemical
 pretreatment 265
 complex formation constants 275, 324
 compressive stress 244
 concave–convex π – π interactions 55
 concave tetrathiafulvalene-type donor 67
 concentrating thermal power (CSP)
 plants 129
 conducting polymers 282
 conical-like [60]fullerene pentaadduct
 derivatives 228
 conical-like “shuttlecock” [60]fullerenes
 227–232
 π -conjugated polymer 280
 cooperativity 79, 80, 379
 – allosteric 80, 81, 99
 – chelate 88, 91, 92, 98
 – between hydrogen bonding and 148
 – negative 80, 90
 – positive 83, 88, 146
 coordination bonding systems 362, 363
 copper nitride islands array 248
 copper porphyrin, gelation of 168
 corannulene 57, 66
 Cotton effects 280
 Coulomb interactions 134–137, 265
 covalent C₆₀ derivatives 208–232
 – conical-like “shuttlecock” [60]
 fullerenes 227–232
 – fulleropyrrolidine-based poly(aryl ester)
 dendrons 208–212
 – liquid–crystalline fullero
 (codendrimers) 218–222
 – liquid–crystalline fulleropyrrolidine-based
 poly(benzyl ether) dendrons 212–217
 – liquid–crystalline methanofullerene
 dendrons 208–212
 – polypetal [60]fullerenes 223–226
 C₆₀-porphyrin interactions 96
 C₆₀-pyridine derivatives 79, 81
 C₆₀-pyridine with metalloporphyrins 79
 C₆₀ receptor 64
 critical micellar concentration (CMC) 160,
 265
 crown ether-appended porphyrin–ferrocene
 dyad 36
 cryogenic electron microscopy
 (Cryo-EM) 306
 crystallographic analyses 62
 C₆₀@SWNTs peapods, HR-TEM image 285
 C₆₀-tethered 2,5-dithienylpyrrole triad 352
 cucurbit[7]uril 57
 CVT-based hydrogen-bonded dimeric
 receptors 63
 cyanuric acid functionalities 34
 cyclacenes 68
 cyclic aromatic compounds 276, 277
 cyclic [n]paraphenylenecetylenes ([n]
 CPPAs) 55, 69, 70
 – crystallographic analysis of 69
 cyclic receptors 68
 cycloaddition reactions 14
 γ -cyclodextrin (γ -CD) 57
 – water-soluble complex of 57
 cyclodextrin molecule 185
 β -cyclodextrins-tethered ruthenium
 complexes 276
 cyclohexane-THF mixture, CD spectra in 167
 cyclopeptidic heterodimer 45
 cyclophenacenes 68
 cyclotrimeratrylene (CTV) 55, 56, 195
 – based dendrimers 196
 – derivative, liquid–crystalline supramolecular
 complex 204–206
 – macrocycle 204
 cylindrical supramolecular dendrimers 213
- d**
- d–d strong interaction 311
 delayed fluorescence (DF) quenching 312
 dendrimer 60
 dendritic molecule 189
 dendron
 – self-assembly 189
 dendronized perylene bisimide 20
 density functional theory calculations 241,
 311
 density gradient ultracentrifugation (DGU)
 technique 267, 268
 diacetylene moieties (DA) 310
 diacetylenic tethers 62
 1,4-diazabicyclo [2.2.2]octane (DABCO) 352
 dibenzylammonium fullerene 32
 diblock copolymer, advantages 182
 dichloromethane 38
 1,3-diethynylphenylene tether 62

- differential scanning calorimetry (DSC) 206
 diffuse reflectance spectra 303
 dihexadecyl hydrogen phosphate (DHP) 162
 1,5-dihydroxynaphthalene (DNP) 111
 dimeric host molecules 63
 dimers, chemical structures of 30
 dimethylmethylphosphonate (DMMP) 327
 1,2-dimyristoyl-3-trimethylammonium propane (DMTAP) 319
 dioctadecyldimethylammonium bromide (DODAB) vesicular system 162
 dipolar interactions 210
 diporphyrin 313
 – chiral 279
 – preadsorbed monolayer 252
 direct electron transfer 354
 discotic triphenylene cores, self-organization 207
 dislocation networks 243, 245
 dispersive forces 237
 2-distearoyl-*sn*-glycero-3-phosphoethanolamine-*N*-amino(PEG)₂₀₀₀(PL-PEG-NH₂) 328
 2-[9-(1,3-dithiol-2-ylidene)anthracen-10(9*H*)-ylidene]1,3-dithiole (exTTF) 189, 254
 – based organogelator 169
 ditopic benzocrown ether receptor BC₂ 86
 ditopic calix[5]arene 187
 ditopic Hamilton receptor 146
 ditopic receptor AA, interaction of monovalent ligand B with 80
 2D metallosupramolecular nanocavities, STM image 253
 2D metal–organic coordination networks (MOCNs) 250
 2D nanomeshes 246–248
 DNA sequences 269
 – design 269
 dodecytrimethylammonium bromide (DTAB) 319
 donor–acceptor dyads 208
 donor–acceptor interactions 249
 donor–acceptor-linked systems 349
 donor–acceptor molecules
 – self-assembly 362
 – supramolecular assembly 356
 donor–donor–acceptor–acceptor (DDAA) hydrogen bonding motif 183
 donor gelator hybrid gels 168
 donor-linked carbon nanotube composites 365
 dumbbell [60]fullerene 187
 dye-sensitized bulk heterojunction solar cells 355
 – fullerene derivatives, and porphyrins employed in 46
 dye-sensitized solar cells (DSSC) 128
 dynamic light scattering (DLS) 305, 306
- e**
 electrochemical deposition 354–359
 electrochemical impedance spectroscopy (EIS) 317
 electrodeposition 129
 electron donor–acceptor complexes, self-assembly of 33
 electronically coupling redox-active biomolecules 316
 electron-positive silicon atom 70
 electron-rich aromatics 55, 111, 383
 electron transfer (ET) mechanisms 259, 314, 384
 – applications in 319
 – rate constant 317
 electron transfer processes 27, 79
 – photoinduced 37
 – size and shape effect of fullerenes on 132
 electrospray mass spectrometry (ESMS) 95
 electrostatic interactions 33, 71, 72, 135, 189, 196, 273, 282, 314, 315, 318, 321, 330, 353, 364
 electrotonic hypothesis, to explain physical interactions between 332
 energy production pathways 301
 enhanced green fluorescent protein (EGFP) 314, 315
 Er₃N@C₈₀ chemical structure 246
 ether oxygen atoms 67
 3,4-ethylenedioxothiophene (EDOT), oxidative polymerization 181
 Eu₈ complex, chemical structure 325
 Eu₈-SWNT devices 326
 extended TTF (exTTF) 42–44, 55, 66–68, 141, 142, 149, 193, 385
 – based receptors 67
 – chromophore 386
- f**
 fabrication techniques 263
 face-to-face-type interaction 64
 fan-shaped poly(benzyl ether) dendrimers 218
 fast Fourier transform (FFT) analysis 303, 304
 ferrocene–porphyrin–crown 36
 ferrocene–porphyrin–fullerene triads 352
 field-effect transistors (FETs) 10, 281, 285, 324

- to detect organic molecules based on 367
- exhibit clear photoresponse 285
- noncovalent functionalization of
 - SWNTs 368
 - fitting process 388
 - flame ionization detector (FID) 327
 - flexible porous network 253
 - fluorescence spectroscopy 135, 378, 379, 383
 - fluorescent biscrown ether 193
 - fluorescent host molecules 65
 - fluorine atoms, nucleophilic substitution of 14
 - Förster resonant energy 145
 - Fourier transform infrared spectroscopy (FTIR) analysis 310
 - Fréchet-type dendrimers 60, 193, 195
 - [60]fullerene barbituric acid 183
 - fullerene-based solar cells 350–363
 - coordination bonding systems 362, 363
 - electrochemical deposition 354–359
 - hydrogen bonding systems 360–362
 - layer-by-layer deposition 353, 354
 - self-assembled monolayers 350–352
 - solution-processed bulk heterojunction solar cells 359, 360
 - fullerene-containing gels
 - amphiphilic C₆₀ derivatives, self-assemblies 164–166
 - gels of fullerenes 166–169
 - pristine C₆₀ solubilization in surfactant assemblies solubilization 160–164
 - solubilizaiton
 - in micelles 160–162
 - in vesicles 162–164
 - supramolecular chemistry 159–170
 - fullerene-containing micelles
 - amphiphilic C₆₀ derivatives, self-assemblies 164–166
 - gels of fullerenes 166–169
 - pristine C₆₀ solubilization in surfactant assemblies solubilization 160–164
 - solubilizaiton in micelles 160–162
 - solubilization in vesicles 162–164
 - supramolecular chemistry 159–170
 - fullerene-containing polymers 2–10. *See also* fullerene-containing supramolecular polymers
 - all-fullerene polymers 2
 - carbon nanotube–fullerene hybrids 9–10
 - cross-linked C₆₀ polymers 3–4
 - end-capped polymers 5
 - fullerene–gold nanoparticles (Au NP) 10
 - heteroatom-containing polymers 2–3
 - star-shaped C₆₀ polymers 5–6
 - supramolecular C₆₀ polymers 8–9
 - fullerene-containing supramolecular dendrimers
 - [60]fullerene polymeric array fabrication 174–178
 - functionalized [60]fullerene, supramolecular polymerization 178–188
 - supramolecular [60]fullerene dendrimer 188–198
 - fullerene-containing supramolecular polymers 173–198, 179
 - complementary noncovalent interaction-driven synthesis 182
 - construction 174
 - [60]fullerene polymeric array fabrication 174–178
 - functionalized [60]fullerene, supramolecular polymerization 178–188
 - supramolecular [60]fullerene dendrimer 188–198
 - [60]fullerene-containing thermotropic liquid crystals 203–233
 - covalent C₆₀ derivatives 208–232
 - noncovalent C₆₀ derivatives 204–208
 - fullerene derivatives 71
 - anti-HIV properties of 315
 - bearing aliphatic chains 305
 - cationic 181
 - chemical structure 242
 - to construct supramolecular triads by 38
 - coordination bonding of 362
 - with crown ether functionality 116
 - disulfide-containing 10
 - as efficient DNA photocleavage agent 314
 - modified with diacetylene moieties 310
 - multisubstituted 9
 - PCBM 47
 - polymeric 2
 - and porphyrins employed in 46
 - pyridine coordinating ligand 37
 - for solution-processed bulk heterojunction solar cells 359
 - thiol-containing 351
 - unable to form complexes(F) 101
 - used with TiO₂ nanostructured electrode 47
 - water-soluble dicationic 354
 - fullerene–ferrocene rotaxanes, structures of 42
 - fullerene–fullerene interactions 86, 88
 - fullerene-functionalized dendrimers 193
 - charge transfer-driven supramolecular assembly 192
 - fullerene–gold nanoparticles (Au NP) 10, 358

- fullerene-grafted polyacetylene,
supramolecular cross-linking 187
- fullerene/host interactions 59
- [60]fullerene in st-PMMA helical cavity,
encapsulation 178
- [60]fullerene–iridium complex 175
- fullerene peapod 68
- [60]fullerene polymeric array
fabrication 174–178
- fullerene/polythiophene derivatives 308
- [60]fullerene/porphyrin/DNA ternary
complex 181
- fullerene–porphyrin–ferrocene
supramolecular rotaxane-type triad 43
- fullerene–pyridine substrates, self-assembly
of 81
- fullerene receptors 56
- curved conjugated system
 - bowl-shaped conjugated systems 66–67
 - carbon nanorings 68–72
 - cylindrical cavity 67, 68
 - modified traditional host molecules 59–61
 - simple traditional hosts 56–59
 - traditional host molecules, dimeric structure
of 62–64
- fullerenes 56, 58. *See also* carbon nanotubes (CNTs)
- ammonium salt, chemical structure of 44
 - at biological interface 313–317
 - bound gold nanoclusters 10
 - complexes 57, 68, 71, 185, 195, 196
 - containing noncovalent systems 79
 - dendritic structures, preparation of 92
 - embedded matrix 312
 - extraction of 55
 - functionalization conventional approaches
(*See* nonpatterned metal surfaces)
 - at gas–solid interface 310–313
 - at solid–liquid interface 307–310
 - supramolecular wires 35
- fullerite 57
- fullero(codendrimers) 220
- liquid–crystalline properties 218, 220
 - smectic phases formation 220
 - supramolecular organization 221
- fullerodendrimers 40, 213, 214, 216, 218,
220, 222
- supramolecular organization 215
- fullerodendrons
- dendritic wedges of 193
 - molecular structures of 40
- fulleropyrrolidine-based poly(aryl ester)
dendrons 208–212
- fulleropyrrolidine *N*-oxides 121
- fulleropyrrolidines, supramolecular
organization 213
- full-width at half-maximum (FWHM) 327
- functionalized [60]fullerene, supramolecular
polymerization 178–188
- host–guest interaction 185–188
 - hydrogen bonding interaction 182–185
 - ionic interaction 179–182
- g**
- gas-phase process 286
- G2NH₃⁺ and G3NH₃⁺, chemical
structure 89
- G-octadecylamine (G-ODA) 17
- grafting functionalized [60]fullerene 182
- graphenes 16, 20
- covalently functionalized few-layer 17
 - functionalization, and solubilization of 1
 - mechanical isolation of 16
 - noncovalent functionalization 17–20
 - noncovalent interactions 18
 - optical applications of 18
- h**
- p*-halooxacalix[3]arenes 57
- Hamilton receptor/cyanuric acid, hydrogen
binding 34
- H-bonded C₆₀–D dyad 32
- H-bonded supramolecular structures 28
- headspace/gas chromatographic/mass
spectrometric (HS/GC/MS)
determination 320
- hexafluoro-2-propanol (HFIP) 42
- hexylene alkyl spacer 34
- highest occupied molecular orbital
(HOMO) 128, 129, 360
- highly oriented pyrolytic graphite
(HOPG) 185, 187, 242, 250,
309, 310
- high-resolution transmission electron
microscopy (HR-TEM) 283
- HIV-1 protease 159
- HOMO–LUMO gap 238
- hoop-shaped cyclic π electron-conjugated
benzenoid system 230
- host–guest calix[4]arene 313
- host–guest complexes 163, 205
- host–guest interaction 185–188
- host–guest motif 193
- host–guest systems 249, 375
- equilibrium of association 375
- hydrocarbon molecules 64
- hydrocarbon receptors 64–65
- hydrogen bond 113

- between ammonium salts and crown ethers 113
- in aqueous solution 306
- barbiturate fullerene, chemical structure of 48
- binding energies 143
- in biological systems 46
- with carboxylic acid group 37
- cooperativity between 148
- CVT-based hydrogen-bonded dimeric receptors 63
- cytidine–guanosine hydrogen bonding interactions 38
- dendrimer possessing [60]fullerene molecules at periphery 195
- donor–acceptor systems assembled by 115
- energies 134
- fullerene polymer 184
- interactions 27, 32, 166, 182–185, 193, 265, 360
- interfaced with 40
- low stability of one-point 145
- between macrocycle and peptide 42
- motifs 28, 29, 49
- networks 248, 251
- between N–H and C=O functional groups 30
- oligothiophene–fullerene polymer 184
- photoelectrochemical devices, donor and acceptor molecules 361
- potential use of 48
- pseudorotaxane assembled by 114
- recognition between ammonium salts and 113
- ribbon 48
- rotaxanes assembled by 115
- supramolecular structures 28
- synergy of 33
- use of three-point 35, 144
- weak 148
- hydrogen-bonded fullerene assemblies 27–49
 - applications 36–49
 - donor–acceptor structures 32–46
 - in dye-sensitized bulk heterojunction solar cells 46
 - electron transfer (eT) 27
- hydrophilic–lipophilic balance (HLB) 164
- hydrophilic residues 30
- hydrophobic interaction 41, 99, 159, 164, 185, 265, 334, 353
- hydroxylation methods, to increase C₆₀ solubility in 306

i

- indium tin oxide (ITO) 306
- inorganic photovoltaic devices 128
- in situ* variable-temperature scanning tunneling microscopy (VT-STM) 312
- π–π interactions 113, 120, 148, 149, 307
- intermolecular interactions 229
- internal photoconversion efficiencies (IPCE) 48, 49, 272, 353, 356, 358, 360, 364, 366
- intersystem crossing (ISC) 129, 325
- intramolecular fullerene–fullerene interactions 88
- intrinsic polymers 2
- ion exchange chromatography (IEX) 269
- ionic interaction 179–182
- IPCE. *See* internal photoconversion efficiencies (IPCE)
- isothermal titration calorimetry (ITC) 378
- ITO/SnO₂ (C₆₀)_m electrode, schematic presentation 355

j

- Job's plot 380, 381, 389

l

- Langmuir–Blodgett deposition techniques 302
- Langmuir–Blodgett (LB) films, formation 302
- laser light scattering measurements 164
- lauric acid (LA) 162
- layer-by-layer (LBL)
 - assembled SWCNT 272, 332
 - deposition 353, 354
 - self-assembly approach 179, 180
- light-emitting diodes (LEDs) 10
- linear acceptor–donor–acceptor (ADA) 47
- liquid-crystalline
 - buckyferrocenes 228
 - fullero(codendrimers) 218–222
 - fulleropyrrolidine-based poly(benzyl ether) dendrons 212–217
 - hexaadduct 223
 - hexakis(methano)fullerenes 223
 - methanofullerene-based poly(aryl ester) dendrons 208–212
- liquid crystals (LCs) 160, 174, 203, 218, 232, 310
- liquid–liquid extraction (LLE) 320
- liquid-phase process 284
- LNH₃⁺, chemical structure of 95
- L(NH₃⁺)₂, chemical structure of 94

- lowest unoccupied molecular orbital (LUMO) 128, 129
- LZn**
- absorption and emission spectra of 85
 - bis-porphyrin, ability of 91
 - chemical structure of 81, 84, 91
 - ditopic receptor 86
 - porphyrin 82
 - spectrophotometric titrations of 85
 - stability constants 83, 85
 - structure of 84
 - thermodynamic studies of 83
 - UV-visible absorption spectrophotometric titration 82
- LZn₂₄, chemical structure of 93
- m**
- macrocycle 205
 - chemical structures 250, 385
 - design 385
 - liquid-crystalline phase 205
 - macrocyclic fullerene receptors 56
 - macrocyclic 1 : 1 supramolecular complex 91, 95
 - MALDI-TOF mass spectroscopy 193
 - malonate-containing mesogens 223
 - melamine-PTCDI network 250
 - meso*-(benzo-15-crown-5)porphyrinato-zinc 38
 - mesogenic molecules, polyaddition 232
 - mesomorphic discotic mesogen Zn(II)-octakis (hexadecylthio)-phthalocyanine 208
 - mesomorphism 212, 223
 - columnar 213, 220
 - consequences for 228
 - destruction of 230
 - of 2 hexaadducts of C₆₀, [6:0] and 223
 - smectic 220
 - mesotetraphenylporphyrins, substituent effects 356
 - metal coordination 27, 107, 110, 111, 131, 152, 188
 - metal-ligand coordination 151
 - metallocenes like ferrocenes 284
 - metalloporphyrins 79, 82, 98, 118, 383
 - metal-organic frameworks (MOFs) 310
 - methanofullerene 70
 - methanofullerene carboxylic acid 182
 - micelles, solubilizaiton in 160–162
 - microelectromechanical system (MEMS)-based microgas chromatography (μ GC) 326
 - microelectronic devices, architecture 325
 - micro/nanoelectromechanical systems (MEMS/NEMS) 305
 - molecular dynamics calculations 222
 - molecular dynamics simulation 226
 - molecule–substrate interaction 238
 - multifullerene dendrimers 356
 - molecular structures 357
 - multiporphyrin-modified gold nanoparticles 357
 - multiwall carbon nanotubes (MWNTs) 281, 321
 - 1-butyl-3-methylimidazolium hexafluorophosphate 287
 - suspension 281
- n**
- NAD/ NADH oxidation processes 317
 - nanocarbon allotropes
 - biological aspects 159
 - fullerene (C₆₀) 159
 - nanostructured devices 302
 - nanostructured TiO₂ electrodes 361
 - photovoltaic properties 362
 - nanotemplates, site-selective adsorption on 238
 - nanotube field-effect transistor device 278
 - nanotube/polyporphyrin composite 282
 - nanotube/porphyrin hybrids 274
 - naphthalenediimide (NDI) 64, 177
 - guest-induced helical assembly 178
 - naphthalene imide 64
 - naphthylene rings 69
 - noncovalent C₆₀ derivatives 204–208
 - C₆₀, self-assembled columns 207
 - with cyclotrimeratrylene derivative 204–206
 - phthalocyanine-[60]fullerene dyads in liquid crystals 208
 - supramolecular complex composed of 206
 - noncovalent interactions 11, 18, 27, 28, 107, 174, 179, 182, 243, 305, 310, 314
 - nonionic surfactants 265
 - micellar solutions 161
 - nonionic triton (TX100) 264
 - nonlinear optical (NLO) response, of fullerenes 122
 - nonpatterned metal surfaces
 - 2D fullerene supramolecular chemistry 240–243
 - fullerene layers on flat metal surfaces, translational and orientational order 239, 240
 - fullerene–metal interactions, nature and strength 238, 239
 - nuclear magnetic resonance (NMR) 29, 34, 94, 378, 382, 383

o

octadodecylamine (ODA) 11
 α,γ -octapeptide 30
 octyloxybiphenyl derivatives 224
 oligothiophene–fullerene dyads 350
 omooxacalix[3]arene, schematic molecular models of 58
 organic chromophores 285
 organic donor/acceptor nanojunction arrays 253, 258
 organic/inorganic hybrid, supramolecular organization 186
 organic moieties, for supramolecular SWNT functionalization 328
 organic molecules
 – properties 301
 – self-assembled monolayer 249
 organic photovoltaic devices (OPVs) 128
 organic solar cells (OSCs) 11
 orientationally disordered C₆₀ monolayer, STM image 239
 Ostwald ripening process 306
 oxacalix[3]arenes 55, 56
 – dimer 62
 oxacalix[3]naphthalene 59
 oxidized graphite (GO) 17

p

passivated emitter, rear locally diffused (PERL) 129
 pentakis[*p*- (perfluoroctyl)phenyl] fullerene 305
 pentathienylmelamine 183
 permeable polymer membrane
 – ethyl cellulose (EC) 312
 – organosilica (OS) 312
 permethoxylated hexa-peri-hexabenzocoronene (HBC) 176, 177
 – cocrystallization 176
 perylene diimide-based surfactants 277
 perylene-3,4,9,10-tetracarboxylic dianhydrides (PTCDA) 285
 3,4,9,10-perylenetetracarboxylic diimide 312
 perylene tetracarboxylic diimide (PTCDI) 250
 3,4,9,10- perylenetetracarboxylic diimide bisbenzenesulfonic acid, disodium salt of 19
 phase transfer catalyst 282
 – tetraoctylammonium bromide (TOAB) 317
 phenol-based receptors 60
 phenyl-C₆₁- butyric acid methyl ester (PCBM) 46, 169, 247
 – analogues, properties 46

– chemical structure of 31
 – formation 255
 – fullerene derivative 241
 – 2D array 244
 – high mobility 258
 – molecules
 – adsorption of 31
 – nucleation of 31
 – nanoscale segregation 257
 o-phenylenevinylene 146
 phosphonate-functionalized polyphenylacetylene gathers 180
 photoactive molecular triad 352
 photoelectrochemical cells 128
 photoexcitation 34, 44, 66, 116, 117, 151, 273, 274, 315, 323
 photoinduced charge transfer 36
 photoinduced electron transfer (PET) 13, 66
 photoinduced energy 79
 photolithographically passivated emitter solar cells (PESC) 129
 photon energy 130
 photosynthetic reaction center (PRC) 129
 photovoltaic devices 127, 354
 phthalocyanine-[60]fullerene dyads, in liquid crystals 208
 PicoGreen dye exclusion 330
 pluronic copolymers 18
 polar functional groups 62
 poly derivatives (PAmPV) 281
 poly(allylamine hydrochloride) (PAH)-modified ITO electrode 354
 poly-amidoamine (PAMAM) 330
 polyaniline emeraldine base (PANI-EB) polymer 181
 poly(benzyl ether) dendrons 214, 217, 221
 poly[2,5-bis(3-sulfonatopropoxy)-1,4-ethynylphenylene] sodium salt (PPES) 282
 poly[2,6- naphthylene]ethynylene sodium salt (PNES) 282
 polycatenar liquid crystals 221
 polycationic C₆₀ derivatives, used as gene delivery systems 314
 polycyclic aromatic compounds 276
 polycyclic aromatic molecules, derivatization 270
 poly(diallyldimethylammonium) (PDDA) 353
 polydispersity 263
 polyethyleneimine (PEI) 321, 326, 332
 poly(ethylene oxide) 165
 polyfluorene (PFO) composites 282
 polyfullerenes 2, 4

- poly(3-hexylthiophene) (P3HT) 48, 281, 359
 – donor/acceptor heterojunction solar cells 169
 – SWNT solar cells 282
 poly(*m*-aminobenzene sulfonic acid) (PABS) 11
 polymer sulfonated polyaniline (PANI) 18, 282
 poly(methyl methacrylate) (PMMA) 18, 177, 178
 poly(methylvinylketone) (poly(MVK)) backbone 333
 poly-L-ornithine (PLO) 332
 polypedal [60]fullerenes 223–226
 polyphenylacetylene (PPA) 281
 poly(p-phenyleneethynylene) (PPE) 282
 poly(1,4-phenylenevinylene) (PPV) 359
 poly(phenylquinoline)-block-polystyrene copolymer 164
 polyrotaxane assembly, supramolecular polymer formation 186
 poly(sodium 4-styrenesulfonate) (PSS) 353
 poly(styrene-*co*-4-vinylpyridine) (PSVPy) 182
 polystyrene, *in situ* polymerization 287
 poly(tetrafluoroethylene) (PTFE) 306
 porphyrin alkanethiol, supramolecular organization 358
 porphyrin–crown ether conjugate (PBC) 95, 96
 – CH_2Cl_2 solution of 96
 – chemical structure of 95
 porphyrin derivatives, used with TiO_2 nanostructured electrode 47
 porphyrin–fullerene conjugates 36, 98
 porphyrin–fullerene-modified ZnO nanorod devices 362
 porphyrin-functionalized dendrimer, multimolecular assembly 191
 porphyrin-peptide oligomers, intermolecular complexes 357
 porphyrins 116
 – chemical structure 254
 – and derived structures 277–280
 – fluorescence of 13
 – gelator, sheet-like morphology 168
 – radical cation 36
 – structures of 38
 – supramolecular wires 35
 postsynaptic currents (PSCs) 331
p-phenylene-ethynylene 146, 147
 – bridged complexes 147
 pseudorotaxane 108, 110, 114, 115, 281, 352
 – assembled by hydrogen bonding 114
 – pseudorotaxane-like complex 32
 PTCDI–melamine network C_{60} heptamers, STM image 252
 pyrenecyclodextrin-decorated nanotubes 275
 pyrenecyclodextrin-decorated SWNT 367
 – hybrids, schematic presentation 324
 pyrenecyclodextrin-decorated SWNT/FET devices 324
 pyrene derivatives 270–276
 1-pyrenemethylamine hydrochloride 273
 pyridine (Py)
 – binding behavior of 82
 – binding properties of 82, 83
 pyridine-ammonium cation-derivatized fullerene 37
N-pyridylfulleropyrrolidine 151
- r**
- real-time polymerase chain reaction (RT-PCR) technique 314
 regular donor/acceptor self-assembly formation 169
 reversible SWNT sensor, integration 327
 riboflavin (RF) 314
 right-handed helical nanotube isomers 279
 robust pyrene-based derivatives,
 preparation 276
 rotaxanes 41, 107
 – assembled by hydrogen bonding 114
 – bistable 109
 – donor–acceptor systems assembled by hydrogen bonds 115
 – dyad 118
 – fullerene-driven molecular shuttle 121
 – fullerenes 110
 – fulleropyrrolidine *N*-oxides, stabilization of 122
 – metal coordination
 – dyads assembled by 112
 – fullerene-stoppered rotaxanes assembled by 111
 – porphyrin– C_{60} dyads 117
 – reverse shuttling 120
 – solvent switchable molecular shuttle 119
 – synthesis
 – with fullerene on macrocycle 117
 – of fullerene-stoppered rotaxane with benzylic amide macrocycle 118
 – from pseudorotaxane 114
 – strategies 107, 108
 – triad 116, 118
 – tuning photoinduced electron transfer through shuttling 123
 ruthenium carbonyl tetraphenylporphyrin (RuTPP) 119

S

scanning electron microscopy (SEM)
analysis 303, 330, 332
scanning tunneling microscopy (STM) 31,
237, 239
second-generation dendrons 214
second-generation molecules 212
self-assembled monolayers (SAMs) 349,
350–352
– methodology 302
self-assembly processes 312
self-complementary hydrogen-bonded
supramolecular polymer 183
self-organizing supermolecular systems 203
semiconducting SWNTs, UV–Vis–NIR
absorption spectra 270
short interfering RNA (siRNA) 329
short-range hexagonal lattice 225
shuttlecock-like [60]fullerene molecules, linear
array 186
side-connected malonates 204
silicon-based metal-oxide semiconductor
(MOS) field-effect transistor (FET) 366
silicon featured water-repellent
superhydrophobicity 304
single-cell electrophysiology techniques 332
single-stranded DNA (ssDNA)
molecules 267
single-walled carbon nanotubes 263, 318, 363
– chirality 278
– dispersion, perylene-based surfactant
used 277
– donor stacked composites 364
– electronic properties 264
– functionalization 278, 326, 364
– high-quality suspension 267
– HR-TEM images 286
– imidazolium-modified SWNTs
(SWNT-Im) 318
– with negatively charged pyrene and positively
charged porphyrins 272
– noncovalent functionalization 322
– pyrene association with double-stranded
DNA 273
– pyrene supramolecular assemblies 274
– reductive retrofunctionalization of 16
– schematic representation 268
– solubilization of 11
– stable suspension 271
– *N*-succinimidyl-1-pyrenebutanoate,
irreversible adsorption 322
– supramolecular structures formation
example 278
– surfactant organization 266

– suspension 264–270
– uses 287
site-selective nucleation 243
small-angle neutron scattering (SANS) 266
small-angle X-ray diffraction analysis 224,
227
SnO₂ electrodes, photovoltaic
properties 362
sodium cholate (SC) encapsulated CoMoCat
SWNTs 268, 269
sodium dodecylbenzenesulfonate (NaDBS)
surfactant 264
sodium dodecylsulfate (SDS) 18, 264
solar cells 350–366
– carbon nanotubes (CNTs) 363–366
– efficiency of 48
– fullerene-based solar cells 350–363
solar energy conversion 127, 129
– coulomb interactions 134–137
– hydrogen bonding 143–150
– metal–ligand coordination 150–154
– photon-to-chemical energy conversion 127
– photon-to-electric energy conversion 127
– photon-to-thermal-to-electric energy
conversion 127
– π–π stacking 137–143
– supramolecular architectures for 130–154
solid–liquid reaction 57
solution-phase Eu₈ emission intensity 325
solution-processed bulk heterojunction solar,
fullerene derivatives for 359, 360
solvent–guest interactions 284
soybean peroxidase (SBP) 320
Specfit® global analysis software 387
spherical molecules, optical properties 237
stability constants, determined by 87
stable macrocyclic noncovalent array,
preparation of 92
π–π stacking 137–143
π stacking interactions 111, 113, 270–280
– application 278
– bistable rotaxane assembled by 113
– cyclic aromatic compounds 276, 277
– fullerene–catenane, synthesis of 113
– porphyrins and derived structures
277–280
– pyrene derivatives 270–276
star-shaped oligothiophene derivative
(SSOD) 250
– chemical structure 251
– self-organized nanocavity array 309
static light scattering (SLS) 305
Stern–Volmer constants (K_{SV}) 60
superlattice, STM image 247

- supramolecular carbon nanotube
 - hybrids 264–288
 - carbon nanotube and surfactants 264–270
 - filling nanotubes 283–288
 - polymers and wrapping 280–283
 - π stacking interactions 270–280
 - single-wall carbon nanotubes suspension 264–270
 - supramolecular complex
 - composed of rigid dendritic porphyrin and fullerene 206
 - structure of 88
 - supramolecular C₆₀–porphyrin conjugates 95
 - supramolecular dendrimer, with fullerene molecules at periphery 190
 - supramolecular donor/acceptor assemblies 271
 - supramolecular [60]fullerene
 - dendrimer 188–198
 - dendrimers, with inner fullerene 193–198
 - dendrimers, with peripheral fullerene 188–193
 - hydrogen bonding-driven self-assembly 194
 - supramolecular fullerene–ferrocene dyad 41
 - supramolecular host–guest approach 203
 - supramolecular lamellar organization 231
 - supramolecular macromolecules, structure 174
 - supramolecular metalloporphyrin–fullerene dyads 98
 - supramolecular nanocomposites synthesis 306
 - supramolecular organization 209, 210, 212
 - supramolecular polymer 185
 - C₆₀ units attached through UP moieties 30
 - driven by head-to-tail donor–acceptor interactions 188
 - formation via complementary interactions 187
 - by polyrotaxane assembly 186
 - supramolecular porphyrin dimer–fullerene tetrad 39
 - supramolecular systems, self-assembly of 79
 - surface plasmon resonance 330
 - surfactants
 - hydrophilic part 160
 - random face-on adsorption 267
 - self-assemblies, in aqueous solutions 161
 - structure 320
 - SWCNTs. *See* single-walled carbon nanotubes
 - SWNT–DNA hybrids 269
 - SWNT/FET devices 322, 324
 - schematic representation 323
 - transistor characteristics 324
 - SWNT/pyrenecyclodextrin hybrids 275
 - SWNTs. *See* single-walled carbon nanotubes
 - syndiotactic poly(methyl methacrylate) 177
- t**
- terthieno-benzenetricarboxylic acid (TTBTA)-C₆₀ host–guest architectures 309
 - tetradecyltrimethylammonium hydroxide (TTAOH) 162
 - tetradecyltrimethylammonium laurate (TTAL) 163
 - tetrahydropyranyl (THP) 227
 - tetraoctylammonium bromide (TOAB) 317
 - substoichiometric ratio 318
 - tetra(piperazine)fullerene epoxide (TPFE) 314
 - tetrathiafulvalene (TTF) 13, 19, 42, 111
 - tetrphthalate diester 66
 - thiol-containing fullerene derivatives 351
 - titanyl phthalocyanine (TiOPc) 244, 245
 - titration experiments 376, 377
 - binding isotherm 388
 - simulated binding isotherms 377
 - transistors 366–368
 - carbon nanotubes 366–368
 - fullerenes 366
 - transition metal complexes 196
 - transition metal ions, coordination bonds of 62
 - transmission electron microscopy (TEM) 13, 306
 - triarylamine-based dendron 61
 - trimesic acid (TMA) molecules 250
 - host networks 308
 - supramolecular 2D architecture 307
 - tritycene, crystallographic analyses of 64
 - tritycene-derived oxacalixarene 68
 - triquinacene-based receptors 65
- u**
- ultrahigh vacuum (UHV) 310
 - conditions 31
 - ultraviolet–visible–near-infrared (UV–vis–NIR) absorbance spectroscopy 265, 326, 327, 383, 384, 386
 - uracil-functionalized poly-*p*-phenylenevinylene carbazole 183
 - 2-ureido-4-pyrimidinone (UP) 29
 - UV–vis titrations 380

v

- van der Waals interactions 64, 65, 71, 176, 237, 267, 302, 307, 353
 vapor deposition 129
 variation plot. *See* Job's plot
 versatile fullerene-based n-channel FETs 366
 vesicles, solubilization in 162–164
 visible light emitting 6T@SWNT peapod 287

w

- water-soluble
 – cationic fullerenes 315
 – CNTs 14
 – dicationic fullerene derivative 354
 – double-CD 185
 – end-capped polymers 5
 – fullerene anions 305
 – fullerene complexes 57
 – network aggregates with 186
 – Newkome dendrons 277
 – polyrotaxane 7

– SWCNT derivatives 14

- vesicles 305
 Watson–Crick H-bonded D–A dyads 38, 39

x

- xerogels 185
 X-ray diffraction analysis (XRD) 205, 210, 214, 303
 X-ray photoelectron spectroscopy (XPS) 321
 X-ray signals 220

z

- zinc naphthalocyanine (ZnNc)
 – derivatives 273
 zinc porphyrins (ZnP) 37, 273
 – self-assembly 362
 Zn(II)-porphyrin absorption bands 81
 Zn(II) porphyrin-appended cholesterol gelator 167, 168
 – gelation ability 168
 ZnP chromophores 34

