

Index

a

adenosine triphosphate (ATP) 227
 aggregation-caused quenching (ACQ)
 effect 145
 aggregation-induced emission (AIE)
 effect 145
 α -cyclodextrin (α -CD) 78, 218
 α, ω -alkanedithiol 19
 alternating current (AC) 8
 (3-aminopropyl)-dimethyl-ethoxysilane
 (APDMES) 497
 (3-aminopropyl)-trimethoxysilane
 (APTMS) 497
 ammonium-based ion pair 176, 178
 anodic aluminum oxide (AAO) channel
 10
 anodized aluminum oxide (AAO)
 membrane 215
 anthracene sulfonate–ammonium ion
 pairs 177
 arylazopyrazole (AAP) 122, 123
 atomic force microscopy (AFM) 327,
 498, 590
 Au NR *see* gold nanorod (GNR)
 azobenzene-modified ion pair 177

b

benzo[5,6]naphthaceno[1,12,11,10-
 jklmna]xanthylum (BNAX)
 bromide salt 7, 170, 171
 benzylpyridinium cation 193
 benzyltrialkylammonium cation 193
 biofouling 203
 biosensor
 AlGaIn/GaN functionality 487–491

Au-Linking and Thiol Group
 Employment 492–494
 biotin-streptavidin 505, 506
 definition 485
 DNA immobilization and
 hybridization 500–504
 FET 486
 nitride surface, oxidation of
 494–497
 silanization of oxidized nitride surface
 497–500
 block copolymer (BCP)
 Au NR 5
 CdSe NR 6
 block copolymer micelle lithography
 (BCML) 209
 blue phase (BP) 97
 borondipyromethene (BODIPY) 177
 boron oxide (BO) system 424
 Bragg's law 310
 branched polymersome (BP) 143
 bulk heterojunction (BHJ) cell 251

c

calamitic 308
 calixarene-induced aggregation (CIA)
 145
 candle soot nanoparticle (CSNP) 525
 carbon nanofiber (CNF) 525–527
 carbon-and nitrogen-based framework
 (CNF) 426
 carbon nanotube (CNT) 523
 Au NRs, templated assembly of 4, 5
 Bi₂Te₃ composites 465, 466
 CMG, self-assembly of 46

- carbon nanotube (CNT) (*contd.*)
 - PANI nanostructured composite 462–464
 - PEDOT-PSS 464
 - photochromic molecule
 - solar thermal fuel, Azo-SWCNT 88, 89
 - spiropyran-modified MWNT, HRP activity 89, 90
 - SWNT electrode 87, 88
 - PHT 468
 - polyaniline 462–464
 - P3OT 467
 - PTH 468
 - PVAc composite 461–462
 - three-component hybrid film 465–467
- cardiac troponin T (cTnT) 225
- casting method, Nafion 388–390
- Center for Disease Control (CDC) 485
- chemical modified graphene (CMG)
 - advantage 39
 - application 39, 57–61
 - electrocatalysis 60–61
 - electrochemical energy storage 59–60
 - optoelectronics 57
 - photocatalysis 57–59
 - CNTs 49–51
 - evaporation induced self-assembly 45
 - flow-directed self-assembly 43–45
 - hydrothermal processes 46
 - interface induced self-assembly 45
 - LB assembly 40–42
 - LbL assembly 42–43
 - liquid crystal-based wet-spinning method 47, 48
 - metal/metal compound composite 53–57
 - polymer composite 51–53
 - space confined hydrothermal processing 48
 - template-directed assembly 45–46
- chemical vapor deposition (CVD) 39
- chiral nematic/cholesteric liquid crystal (CLC)
 - confinement mediated helical axis change
 - blue-shift 331
 - boundary geometry 333
 - colloidal dispersion 336
 - colloidal particle 337
 - elastomer morphology change 339
 - Grandjean-Cano wedge cell 329
 - homeotropic orientation 337
 - isotropic phase 331
 - “Janus” colloid 337
 - Leslie torque 333
 - microdroplet 333
 - microfluidic technique 335
 - microshell 335
 - periodic arch texture 329
 - planar alignment 335
 - “Saturn ring” defect 337
 - Stoke’s law 337
 - 2D diffraction grating 331
 - field induced helical axis switching
 - bimesogenic compounds 317
 - blue shift 315
 - color tuning 313
 - developable modulation 318
 - electromechanical effect 313
 - flexoelectricity 315
 - growing modulation 318
 - Helfrich texture 313
 - homeotropic aligned cell 319
 - homogeneous process 313
 - lithography process 317
 - nucleation process 313
 - PDLCs 312
 - photopolymerization 312
 - planar shaped polymer network 312
 - Raman-Nath diffraction 317
 - reflective and non-reflective pixel 312
 - sawtooth morphology 318
 - UHL configuration 317
 - wedge cell 319
 - microscopic and mesoscopic scale 307
 - optically driven helical axis switching

- azobenzene derivative 322
- buffing process 324
- fluorene-derived molecular motor 326
- Fréedericksz transition 320
- Gaussian light distribution 327
- Grandjean texture 325
- homeotropic alignment 320, 325
- LH texture 328
- photo active material 322
- photolithography method 325
- phototunable dopant/mesogen 319
- topological diversity 322
- 2-D undulated pattern 323
- UV irradiation 323
- polymer composite, helical axis switching
 - conductive polymer 340
 - Frank elasticity 344
 - LCEs 342
 - polyacetylene 341
 - PSCT 339
 - surface topography 341
 - symmetry breaking 344
 - UV illumination 341
- self-organization 308–311
- smart composite 307
- cholesteric liquid crystal (CLC)
 - electric field-based tunable
 - self-assembled photonic crystal
 - lower bend elastic constant 373–374
 - negative dielectric anisotropy LC host 374–377
 - polymer stabilized CLC, 371–373 377
 - primary color development 368
 - transverse electric field 368–371
 - photochromic molecule
 - blue phase superstructure 97
 - helical pitch and handedness 93
 - microshell and microdroplet 98–100
 - nematic LC, HTP 93
 - UCNP, NIR light 94, 96
 - self-assembled organic photonic crystal
 - advantage of 363
 - cholesteric pitch 366
 - director axis 364
 - intermolecular interaction, asymmetry of 365
 - nematic phase, molecular organization in 364, 365
 - order parameter 364
 - right-handed spiral periodic structure, PBG in 366
 - smectic phase, molecular organization in 365
 - circular dichroism (CD) 550
 - circularly polarized luminescence (CPL) 186
 - aromatic conjugated polymer 548
 - chirality transfer and transcription 549
 - chiral substituent 547
 - dynamic switching 549
 - helical conjugated polymer 548
 - N*-LC 549
 - polyacetylene 550
 - polymer structure, chiral PT 548
 - CLC *see* chiral nematic/cholesteric liquid crystal (CLC)
 - colloidal crystal template method 215
 - concanavalin A (Con A) 234
 - conjugated polymer *see* circularly polarized luminescence (CPL)
 - DiLCPA, blue and green LPL *see* di-substituted liquid crystalline PA (diLCPA)
 - dynamic CPL switching, thermotropic N*-LC
 - CPL-switching mechanism 559–561
 - main-chain-type liquid crystallinity 558
 - molecular structures of 559
 - preparation 559
 - selective reflection band 558
 - LCPPE
 - achiral aromatic conjugated polymer 562

- conjugated polymer *see* circularly polarized luminescence (CPL) (*contd.*)
 - chirality of monoPA 565
 - chirality transfer system 566–567
 - monoPA 563–565
 - rhodium catalyst 562
- covalent organic framework (COF) 419
 - BO-based COF 425
 - crystal structure 422
 - metal-free semiconductor 424
 - porous graphitic structure 424
 - schematic illustration 421
 - TP-COF 424
- covalent triazine-based framework (CTF) 425
- critical aggregation concentration (CAC) 145
- cross-linking 398
- crystal violet (CV⁺) cation 181
- cucurbit[n]uril (CB[n]) 123, 128
- cyclic voltammetry (CV) 225
- cyclobis(paraquat-*p*-phenylene) (CBPQT4⁺) 145

- d**
- density functional theory (DFT) 183
- developable modulation (DM) 318
- dibenzo[jk,mn]naphtho[2,1,8-fgh]thebenidinium (DBNT) 170, 171
- diethyleneglycol (DEG) 14
- differential scanning calorimetry (DSC) 250, 578
- 2-(dimethylamino)ethanethiol hydrochloride (DMAET) 20
- 4,4-dimethylaminopyridine (DMAP) 182
- dimethylformamide (DMF) 526
- dimethylsulphoxide (DMSO) 452
- dip coating technique 284–286
- direct current (DC) 8
- discotic liquid crystal (DLC)
 - Col phase alignment 293–295
 - anisotropic charge transport 253
- dewetting and electromigration 273–276
- dip coating 284–286
- electric-field-induced alignment 288–290
- electrode surface 292
- hexabenzocoronene derivative 257
- homeotropic alignment 252, 253
- intermolecular interaction 254
- LB deposition 266–269
- magnetic-field-induced alignment 287–288
- MALDI mass spectrometry 291, 292
- molecular wire 248, 250
- nanopores and nanogroove 277–281
- OFET 252
- OLED 252
- 1D-stacking 249
- organic heterojunction solar cell 251
- photoalignment, infrared irradiation 290–291
- phthalocyanine derivative 259, 261
- planar/homogeneous alignment 253
- POM 254, 255
- porphyrin 257, 259
- pyrene tetracarboxylate derivative 260, 261
- sacrificial layer 276–277
- SAMs, application of 269–272
- scanning probe microscopy 255
- SIP 286
- surface treatment 262–266
- SVA 285
- SWNT 292
- triphenylene derivative 256, 257, 291, 293
- 2D-lattice 249
- XRD 254, 260
- zone casting 281–283
- zone melting 283–284
- general template for 248, 249

- nematic phase 248, 249
 - p- and n-type DLC, cores for 248, 249
 - distributed Bragg reflection (DBR) 335
 - distributed feedback (DFB) 335
 - di-substituted liquid crystalline PA (diLCPA)
 - LPL 554
 - lyotropic N*-LC
 - CPL 557
 - liquid crystallinity 555–557
 - molecular structures of 555
 - polydispersity 555
 - solvent-to-polymer chirality transfer method 554
 - dodecyltrimethylammonium bromide (DTAB) 20
- e**
- elastic continuum theory 311
 - electric field
 - DLC, alignment of 288
 - 1D NC, assembly of 7–10
 - tunable self-assembled photonic crystal
 - CLCs *see* cholesteric liquid crystal (CLC)
 - opal structure 367
 - electrochemical energy storage 59–60
 - electrochemical energy storage device (EESD) 429
 - electrochemical impedance spectroscopy (EIS) 225
 - electrochemical quartz crystal microbalance with dissipation (E-QCM-D) 226
 - electroluminescence (EL) 547
 - electron beam (e-beam) lithography 207
 - electro-osmosis effect 393
 - electrospinning technique 388
 - electrostatic potential (ESP) 183
 - enzyme-linked immunosorbent assay (ELISA) 485
 - EPR spin probe technique 586
 - 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide hydrochloride (EDC) 499
 - ethylene glycol (EG) 452
 - evaporation induced self-assembly, graphene 45
 - evaporation mediated assembly 17–19
 - extracellular matrix (ECM) 209
- f**
- few-walled carbon nanotube (FWCNT) 222
 - field-effect transistor (FET) 58, 486
 - flash-photolysis time-resolved microwave conductivity (FP-TRMC) method 176
 - fluorescent resonance energy transfer (FRET)
 - QD, photochromic molecule 81–83
 - focal-conic (FC) texture 310
 - Förster resonance energy transfer 26
 - Frank free energy 311
 - friction transfer 262
- g**
- gallium nitride (GaN) 486
 - glutamate 215
 - gold (I) cyanide (AuCN) nanowire 56
 - gold nanoparticle (Au-NP)
 - hollow graphene capsule 43
 - photochromic molecule
 - azobenzene isomerization quantum yield 77
 - light-controlled assembly 78, 80
 - water and toluene, reversible phase transfer 78
 - gold nanorod (GNR)
 - BCP, nanodomains of 5
 - blue phase superstructure 97
 - capillary assembly of 2, 3
 - CNT-templated assembly of 5
 - DLC 271, 272
 - electric field driven assembly 10
 - evaporation mediated assembly 17
 - linear binary assembly of 14, 15
 - liquid crystal 7

- gold nanorod (GNR) (*contd.*)
 - LSPR 1, 25
 - photothermal effect 1
 - polymer tethered self-assembly of 22
 - reversible pH controlled assembly 21
 - small molecule 19, 21
 - supercrystals array 4
- Grandjean texture 325
- graphene nanosheet-CdS quantum dot (GN-CdS QD) 55
- graphene nanostructure
 - application 57–61
 - electrocatalysis 60–61
 - electrochemical energy storage 59–60
 - optoelectronics 57
 - photocatalysis 57–59
 - CNTs, 49–51
 - CVD and epitaxial growth 39
 - evaporation induced self-assembly 45
 - flow-directed self-assembly 43–45
 - hydrothermal processe 45
 - interface induced self-assembly 45
 - LB assembly 41–42
 - LbL assembly 42–43
 - liquid crystal-based wet-spinning method 47, 48
 - mechanical/chemical exfoliation 39
 - metal/metal compound composite 53–57
 - polymer composite 51–53
 - pristine defect-free graphene 39
 - space confined hydrothermal processing 48
 - template-directed assembly 45–46
 - 2D structure 39
 - 3D graphene network (3D GN) 55
- graphene oxide (GO) *see* chemical modified graphene (CMG)
- graphene oxide/hyaluronic acid-spiropyran (rGO/HA-SP) 91, 93
- graphene, photochromic molecule 90–91
- graphoepitaxy 263
- Grotthus mechanism 386, 397
- growing modulation (GM) 318
- h**
- helical axis switching, CLC
 - field induced helical axis
 - bimesogenic compound 317
 - blue shift 315
 - color tuning 313
 - developable modulation 318
 - electromechanical effect 313
 - flexoelectricity 315
 - growing modulation 318
 - Helfrich texture 313
 - homeotropic aligned cell 319
 - homogeneous process 313
 - lithography process 317
 - nucleation process 313
 - PDLCs 312
 - photopolymerization 312
 - planar shaped polymer network 312
 - Raman-Nath diffraction 317
 - reflective and non-reflective pixel 312
 - sawtooth morphology 318
 - UHL configuration 317
 - wedge cell 319
 - optically driven helical axis
 - azobenzene derivative 322
 - buffing process 324
 - fluorene-derived molecular motor 326
 - Fréedericksz transition 320
 - Gaussian light distribution 327
 - Grandjean texture 325
 - homeotropic alignment 320, 325
 - LH texture 328
 - photo activated material 322
 - photolithography method 325
 - phototunable dopant/mesogen 319
 - topological diversity 322
 - 2-D undulated pattern 323
 - UV irradiation 323
 - polymer composite

- conductive polymer 340
 - Frank elasticity 344
 - LCEs 342
 - polyacetylene 341
 - PSCTs 339
 - surface topography 341
 - symmetry breaking 344
 - UV illumination 341
 - helical twisting power (HTP) 94, 310, 375, 377
 - heteropolyacid 402
 - heterostructure field effect transistor (HFET) 487
 - hexabenzocoronene (HBC) 168, 257
 - highly oriented pyrolytic graphite (HOPG) 4, 222, 265
 - hollow mesoporous silica (HMS) 405
 - horseradish peroxidase (HRP) 89, 90
 - host-guest system
 - definition 113
 - photo-responsive host-guest system
 - see* photo-responsive host-guest system
 - reversible self-assembly/disassembly of 114
 - hybrid field switching (HFS) 313
 - hybrid organic-nitride semiconductor nanostructure *see* biosensor
 - hybrid raspberry-like colloid (HRC) 155
 - hydrogen evolution reaction (HER) 61
 - 2-hydroxyethyl methacrylate (HEMA) 224
 - hydroxyl-terminated oligo(ethylene glycol) methacrylate (HOEGMA) 224
- i**
- imidazolium-appended triphenylene ion pair 176
 - imidazolium-based ion pair 176, 178
 - immunoglobulin isotype G (IgG) 507
 - indium tin oxide (ITO) electrode 210
 - inductively coupled plasma (ICP) 494
 - inorganic fibre matrix 388
 - inorganic salts 165
 - in situ* sol-gel method, Nafion 391–393
 - interferometric lithography (IL) 209
 - intrinsically disordered protein (IDP) 234
 - ionic liquid crystal (ILC) 165
 - ionic self-assembly (ISA) 165
 - ion liquids (ILs) 403
 - ion-pairing liquid crystal 188–193
- l**
- Laguerre-Gaussian (LG) vortex beam 320
 - Langmuir-Blodgett (LB) technique
 - CMGs, self-assembly for 40, 42
 - DLC 266, 268
 - 1D NC, assembly of 15, 16
 - lanthanide-doped nanomaterial 95
 - laser-generated focused ultrasound (LGFU) 534–536
 - layer-by-layer (LbL) assembly
 - CMG, self-assembly for
 - electrostatic interaction 42, 43
 - GNs-CdS QD 55
 - hollow graphene capsule 43
 - multilayer architecture 42
 - polymer hybrid film 52
 - thin film formation 204–206
 - layer-by-layer self-assembly, polyelectrolyte 138
 - LC elastomer (LCE) 342
 - ligand guided assembly, 1D NC
 - biomolecular ligand 23–25
 - functional ligand 19
 - polymeric species 21–23
 - small molecule 19–21
 - light-directed self-assembly 78, 100
 - light-emitting diode (LED) 547
 - Li-ion batteries (LIBs) 60
 - linearly polarized luminescence (LPL) 547
 - liquid-air interface 15–1745
 - liquid crystal display (LCD) 248, 547
 - liquid crystal (LC)
 - application 248
 - DLC *see* discotic liquid crystal (DLC)

- liquid crystal (LC) (*contd.*)
 - graphene 46, 48
 - mesophase 247
 - 1D NC, assembly of 7
 - thermotropic/lyotropic 247
 - liquid-liquid interface 14–15
 - liquid phase deposition (LPD) 387, 393
 - lithographically controlled wetting (LCW) 273, 274
 - lithographic technique 206–209
 - localized surface plasmon resonance (LSPR) 97, 529
 - lower critical solution temperature (LCST) 148
 - lyotropics 308
- m**
- magnetic field 10–12
 - DLCs, alignment of 287, 288
 - 1D NCs, assembly of 10, 11
 - Mauguin* regime 310
 - matrix-assisted laser
 - desorption/ionization (MALDI) mass spectrometry 291
 - mercaptoethanol (MET) 211
 - 16-(mercapto)hexadecanoic acid (MHA) 210
 - 11-mercaptoundecanoic-acid (MUA) 211
 - mesogen-functionized plasmonic gold nanorod (M-GNR) 97
 - mesoporous silica nanoparticle (MSN)
 - characteristics 83
 - hexagonal, cubic/lamellar structure 83
 - photochromic hybrid nanomaterial
 - azobenzene-modified MCM-41, nanovalve 85, 86
 - Azo-MSN 83, 85
 - photoregulated nanoimpeller 83
 - metal organic framework (MOF) 419
 - metal oxide semiconductor field effect transistor (MOSFET) 486
 - 2-(2-methoxyethoxy)ethyl methacrylate (MEO₂MA) 225, 226
 - microcontact printing 208
 - microfluidic technique 12, 335
 - molecular epitaxy 263
 - molecular imprinted polymer (MIP) 215
 - multi-walled nanotube (MWNT), photochromic molecule 87–90
 - multiwalled carbon nanotube (MWCNT), graphene hybrid 50, 52
- n**
- Nafion
 - dehydration process 386
 - Grotthus mechanism 386
 - hydrophilic sulfuric acid (-SO₃H) side chain 386
 - hydrophobic C-F backbone 386
 - inorganic fillers stability 392
 - LPD 393
 - metal oxide
 - casting method 388, 390
 - in situ* sol–gel method 391–393
 - proton conductivity 394
 - proton transportation 386, 387
 - vehicle mechanism 386
 - nanocontact printing (nCP) 209
 - nanocrystal (NC)
 - applications of 1
 - 1D NC, controlled self-assembly of *see* one-dimensional nanocrystal (1D NC)
 - nanographene (NG) 222
 - nanomedicine product 203
 - nanostructured organic–inorganic hybrid membrane, PEMFC
 - alternative PA doped hybrid membrane 404–405
 - hydrocarbon polymer 394–396
 - Nafion *see* Nafion based hybrid membrane
 - PBI *see* polybenzimidazole (PBI)
 - near-infrared (NIR) light, photochromic chiral molecular switch 94, 96
 - negative dielectric anisotropy liquid crystal 374–377
 - twist bend nematic (Ntb) liquid crystal phase

- amphiphilic compound 576
 - banana-calamitic dimer 597
 - bent-core compound 577, 584
 - bent-splay modulation 597
 - biomacromolecule 576
 - characterization of
 - deuterium NMR spectroscopy 582
 - FF-TEM technique 583
 - optical texture 582
 - periodic and arched domain 583
 - POM texture 583
 - rope-like texture 582
 - smectic-like behavior 582
 - X-ray scattering technique 581
 - cyanobiphenyl dimer 598
 - discotic compound 577
 - DSC 578
 - ether-linked dimer 594–595
 - helical cholesteric phase 606–608
 - hybrid dimer 598
 - imino-linked dimer 595–597
 - lyotropic LC phase 576
 - mesophase 575
 - methylene-linked dimer
 - achiral dimer molecule 590
 - AFM technique 590
 - atomistic model 589
 - birefringence measurement 590
 - CB9CB 590
 - chemical structure of 593
 - chiral biasing phenomenon 589
 - cyanobiphenyl dimer 589, 593
 - difluoroterphenyl dimer 591
 - “distributed-tilt” model 587
 - domain pattern formation 591
 - electro-optics 590
 - EPR spin probe technique 586
 - filamentous fiber 591
 - flexoelectric property 586
 - helical morphology 589
 - mesogenic unit 593
 - molecular symmetry 593
 - nematic-nematic phase transition 588
 - polarized Raman spectroscopy 587
 - polar switching 591
 - POM and DSC technique 593
 - stripe periodicity 591
 - symmetric bimesogen 585
 - unsymmetrical dimer 592
 - mixture 604–606
 - molecular organization 576
 - nanoscale periodic structure 597
 - nanoscale supramolecular architecture 599
 - orientational and positional ordering 576
 - photo-responsive azobenzene moiety 599
 - POM 578
 - tetramer 603–604
 - thermotropic LC phase 576
 - trimer 600–603
 - twist-bend nematic phase 578–581
 - unsymmetrical dimers, chemical structure of 599
 - XRD 578
 - N-Hydroxylsuccinimide (NHS) 499
- O**
- oligo(ethylene glycol) methacrylate (OEGMA) 226
 - one-dimensional nanocrystal (1D NC)
 - challenge 28
 - field-driven assembly
 - advantage 12
 - electric field 7–10
 - flow field 12–13
 - limitation 13
 - magnetic field 10–12
 - interfacial assembly
 - evaporation mediated assembly 17–19
 - liquid-air interface 15–17
 - liquid-liquid interface 14–15
 - ligand guided assembly
 - biomolecular ligand 23–25
 - functional ligand 19
 - polymeric specie 21–23
 - small molecule 19–21

- one-dimensional nanocrystal (1D NC)
 - (*contd.*)
 - propertie and application
 - CdSe/CdS core-shell NR, PL spectra of 26, 27
 - ferromagnetic/antiferromagnetic coupling 28
 - plasmon coupling 25, 26
 - vs. spherical NC 1
 - templated assembly
 - application 2
 - chemically patterned template 4–7
 - CNT 4, 5
 - geometrically patterned template 2–4
 - liquid crystal 7
 - phase-separated BCP 5, 6
 - predesigned template 2
 - open-circuit voltage (OCV) 427
 - optoacoustic conversion,
 - polymer-nanomaterial composite
 - application 543
 - carbon material
 - carbon black 525
 - CNFs 525–527
 - CNT composite 523–525
 - CSNP 525
 - rGO composite 527
 - solution processed CNT 527
 - transparent polymer 522
 - CNT-PDMS composite, real-time terahertz detection 539–541
 - fabrication 543
 - fundamental, optoacoustic generation 520–521
 - heat transfer 521–522
 - high optoacoustic conversion 542
 - mechanical robustness 543
 - metal-based composite
 - gold nanoparticle PDMS composite 529
 - metal film 529–530
 - nanostructured gold array 528–529
 - silver plasmon enhanced
 - optoacoustic generation 529
 - performance comparison 531
 - therapeutic applications, ultrasound
 - high precision cavitation therapy 534–535
 - spatiotemporal drug delivery 535–537
 - ultrasound imaging
 - optical fiber-based ultrasound probe 539
 - optical ultrasound probe 539
 - organic-based topological insulator (OTI) 435
 - organic field effect transistor (OFET) 252
 - organic ion pair 165
 - organic light emitting diodes (OLEDs) 252
 - organic solar cells (OSCs) 251
 - organogels 140
 - oxygen evolution reaction (OER) 55, 61
 - oxygen reduction reaction (ORR) 60, 433
- p**
- Fabry-Perot (FP) cavity 539
 - Peltier effect 445
 - pentacyanocyclopentadienide (PCCp–)
 - anion 179, 182
 - 3-*n*-pentadecylphenol (PDP) 6
 - pentamethoxy-substituted
 - Cp–(PMCP–) anion 181, 182
 - perfluorosulfonic acid (PFSA) 383
 - perovskite-type oxide 403
 - 9-phenylbenzo[1,2]quinolizino [3,4,5,6-fed]phenanthridinylium (PQP+) cation 170, 172
 - phenylboronic acid (PBA) 228
 - phosphonium ion pair 169, 170, 176
 - phosphoric acid doped
 - polybenzimidazole (PA/PBI) 384
 - phosphotungstic acid (PWA) 385, 394
 - photoacoustic (PA) lens 534

- photochromic organic and hybrid nanostructured material
- carbon nanotube
 - solar thermal fuel, Azo-SWCNT 88, 89
 - spiropyran-modified MWNT, HRP activity 89, 90
 - SWNT electrode 87, 88
- chiral liquid crystal
 - blue phase superstructure 97
 - cholesteric liquid crystalline superstructure 93–97
 - microshells and microdroplet 99
- gold nanoparticle
 - azobenzene isomerization quantum yield 77
 - light-controlled assembly 78, 80
 - water and toluene, reversible phase transfer 78
- graphene derivative 90, 93
- mesoporous silica nanoparticle
 - azobenzene-modified MCM-41, nanovalve 85, 86
 - Azo-MSNs 83, 85
 - photoregulated nanoimpeller 83
- physical properties 75
- quantum dots, FRET process 81
- T- and P-type 75
- photochromism 75
- photolithography 207
- photoluminescence (PL) 27
- photonic band gap (PBG)
 - definition 359
 - electric field-induced wavelength tuning
 - cholesteric LCs *see* cholesteric liquid crystal (CLC)
 - opal structure 367
 - energy dispersion relation 359, 361
 - light propagation 361, 362
 - right-handed spiral periodic structure 366
- photonic crystal
 - electric field-based tunable self-assembled photonic crystal
 - cholesteric LCs *see* cholesteric liquid crystal (CLC)
 - opal structure 367
 - vs.* electronic crystal 360
 - lattice constant 362
 - one-, two-, and three-dimensional crystal 359, 360
- photonic band gap (PBG)
 - definition 359
 - energy dispersion relation 359–361
 - 1D PBG medium, light propagation in 361, 362
- self-assembled organic photonic crystal
 - cholesteric LC 363–366
 - opal structure 363
- photo-responsive host-guest system
 - azobenzene and derivative 113
 - immobilized on surface
 - advantage 148
 - α -CD-capped AuNP 151
 - β -CD dimer catalyst and azobenzene derivative 150
 - HRC 155
 - MNP-CDV 154, 155
 - silica nanoparticle 151, 153
 - TiO₂ NPs 156
- supramolecular polymer and assemble
 - AAP, CDV and CDAuNP 122, 123
 - azobenzene derivative 133, 135
 - BSC4 and α -CD-based pseudo[3]rotaxane 120
 - [c2]AzoCD2 hydrogel/xerogel 122, 124
 - CB[8] and guest molecule 123, 128
 - CB[8]-containing multilayer film 138, 139
 - covalent and noncovalent polymer 129, 132
 - dual-stimuli responsible supramolecular polymer 129, 130
 - linear supramolecular polymer 115, 117

- photo-responsive host-guest system
(*contd.*)
- micelles and vesicle,
 - supramolecular amphiphile 140, 149
 - netlike supramolecular polymer 116, 133
 - noncovalently cross-linked
 - branched polymer 139, 140
 - phototrigger 118, 119
 - polyelectrolytes, layer-by-layer (LbL) self-assembly 138, 139
 - polymeric gel, chemical structure of 124
 - PPR hydrogel, reversible
 - disassembly/reassembly process 121
 - red-light-induced protein release 135, 136
 - reversible sol-gel transition 135, 136
 - self-healing supramolecular hydrogel 140, 141
 - stilbene-linked bis- β -CD dimer 119
 - ternary host-guest complex,
 - hierarchical assembly 135, 137
- photo-switchable drug 203
- phthalocyanine (Pc) derivative 259, 261
- Pickering emulsion 14
- π -electronic ion pair
- BNAX bromide 177
 - charge-by-charge mode 166
 - charge-segregated assembly 167
 - classification of 166
 - definition 166
 - intermediate assembling mode 167
 - ionic liquid crystal 175–177
 - ion-pairing liquid crystal 189
 - meso-hydroxy dipyrrolyldiketone,
 - BF2 complexe of 182, 183
 - nanofiber
 - amphiphilic HBC 1, 168
 - amphiphilic Pt(II) complexe 168, 169
 - BNAX salt with bromide 7, 170, 171
 - DBNT salt 170, 171
 - phosphonium ion pair 169, 170
 - PQP salt 171
 - nanotube
 - methanol solution 173, 174
 - 1D nanostructure 175
 - porphyrins 172, 173
 - PQP+ salts 174
 - trioxatriangulenium salt 174
 - PCCp-anions 179, 182
 - planar anions 181
 - PQP cation 179
 - solid-state assemblie
 - anion-responsive molecule 184–186
 - receptor-anion complex 186
 - supramolecular gels 187
 - planar/Grandjean texture 310, 549
 - polarizing optical microscopy (POM) 250, 254, 255, 578
 - polyacetylene (PA) 449, 550
 - poly(acrylamide-co-acrylic acid) (P(AAc-co-AAM) 230
 - poly(acrylamidophenylboronic acid) (polyAAPBA) 228
 - poly(acrylic acid) (PAA) 53, 229
 - polyaniline (PANI) 213, 449
 - polybenzimidazole (PBI) 386
 - conductive inorganic filler,
 - functionalization 400–401
 - non-proton conductor 398–400
 - poly(bithienylene phenylene)s [PBTPs] 549
 - polycyclic aromatic hydrocarbon (PAH) 170
 - poly(2-diethylaminoethyl methacrylate) (PDEAEMA) 229
 - poly(2-(dimethylamino)ethyl methacrylate) (PDMAEMA) 233
 - polydimethylsiloxane (PDMS) 4, 221, 521
 - polyelectrolyte 138, 139
 - polyethersulfone (PES) 405
 - polyethylene glycol (PEG) 216

- poly(ethylene oxide) (PEO) 6
poly(3,4-ethylenedioxythiophene) (PEDOT) 213, 215, 221
polyhexahydrotriazine (PHT) 468
poly(3-octylthiophene) (P3OT) 467
polymerase chain reaction (PCR) 485
polymer dispersed LC (PDLC) 312
polymer stabilized cholesteric texture (PSCT) 312, 339
poly (methyl methacrylate) (PMMA) 229, 233, 363
poly(nickel 1,1,2,2-ethenetetrathiolate) (PETT) 465
poly(N-isopropylacrylamide) (PNIPAM) 222–224, 227, 363
poly(phenylene ethynylene) (PEE) 224
polypseudorotaxane (PPR) 121
polypyrrole (PPy) 53, 213, 215
polystyrene (PS) 363
polystyrene sulphonate stabilized graphene (PSS-G) sheet 53, 54
polytetrafluoroethylene (PTFE) 264
polythiophene (PTh) 213, 468
poly(vinyl acetate) (PVAc) 461–462
poly (vinyl alcohol) (PVA) 53, 325
poly(vinyl chloride) (PVC) 465
poly(4-vinyl pyridine) (P4VP) 234
polyvinylpyrrolidone (PVP) 405
polyvinylpyrrolidone-stabilized graphene (PVP-G) 53
porous coordination polymer (PCP) 419
porphyrin 257, 259
propidium iodide (PI) 85
proton exchange membrane fuel cell (PEMFC) 383 *see also* nanostructured organic–inorganic hybrid membrane, PEMFC operating principle 383 operation temperature of 384 PA/PBI 384
PS-*b*-poly(4-vinylpyridine) (PS-*b*-P4VP) 6, 7
Pulse laser beam 534
pyridinium ion pair 177
pyrrole-based anion-responsive molecule 185
- q**
quantum dot (QD)
GNs-CdS QD 55
photochromic molecule 81–83
quaternary ammonium-modified tetraphenylethene (QA-TPE) guest 145
quaternary ammonium salt (QAS) 224
- r**
reactive ion etching (RIE) 494
reduced graphene oxides (rGO) *see* chemical modified graphene (CMG)
Nernst equation 427
room temperature phosphorescence (RTP) 140
- s**
scanning electron microscopy (SEM) 168
scanning probe microscopy 255
Schottky barrier height (SBH) 497
Seebeck effect 445
self-assembled monolayer (SAM)
DLCs, alignment of 269, 272
stimuli-responsive surface electrically-driven surface 209–216 low-density 206 mixed/multi-component 206 molecular structure 205 orthogonal functionalization 206 silane-silicon dioxide SAM 205 thermo-responsive surface 222 thiol-gold interaction 205
self-assembly method
Nafion-SiO₂ nanoparticle 390
self-assembled monolayer (SAM) 491
self-healing supramolecular polymer hydrogel 140, 141
silane-cross-linked PBI (SCPBI) 399
silane-cross-linked SPIBI (CSiSPIBI) 399

- silica nanoparticle 151, 153
- silicon carbide (SiC) fibre matrix 388
- silicon nanowire (SiN) array 232
- single-crystal X-ray analysis 187
- single-walled carbon nanotube (SWCNT), graphene hybrid 49
- single-walled nanotube (SWNT), photochromic molecule 87–89
- sodium chloride (NaCl) 165
- sodium dodecylbenzenesulfonate (SDBS) 227
- soft-lithography 208
- solid oxide fuel cell (SOFC) 383
- solvent induced precipitation (SIP) 285
- solvent vapor annealing (SVA) 285
- stamp-print technique 274, 277
- standing helix (SH) 317
- stimuli-responsive host-guest system 113
- stimuli-responsive surface, biomedical application
- chemical stimuli 227, 234
 - electrically-driven surface polymer 213
 - SAM 209, 212
 - lithographic technique 206
 - photo-responsive surface 216, 222
 - thermo-responsive surface
 - physisorbed self-assembled network 222
 - polymer 223, 226
 - SAM 222 - thin film formation
 - layer-by-layer (LbL) assembly 206
 - SAM 205
- Stöber method 151
- Stoke's law 337
- sulfonated poly(arylene ether sulfone) (SPAES) 394, 396
- sulfonated polyhedral oligosilsesquioxane (S-POSS) 400
- sulfonated poly(imide benzimidazole) (SPIBI) 399
- sulfonatocalixarene 146
- supercapacitor (SC) 59
- supramolecular amphiphiles (SA)
- AIE and ACQ effect 145
 - CBPQT4⁺ 145
 - CD-BP and azobenzene BP 143
 - cucurbit[7]uril/butyrylcholine host-guest interaction 144, 145
 - DNA capture and release system 142
 - non-covalent interaction 142
 - pillararene 145, 149
- t**
- templated assembly, 1D NC
- application 2
 - chemically patterned template
 - CNT 4–5
 - vs. geometrically patterned template 7
 - liquid crystal 7
 - phase-separated BCP 5, 6 - geometrically patterned template 2, 4
 - predesigned template 2
- tetrabutylammonium hydroxide (TBAOH) 181
- tetraphenylethene 146
- thermal annealing 262, 264
- thermoelectric (TE) material 445
- charge flow, direction of 446
 - hybrid nanostructured composite 453, 454
 - inorganic thermoelectric material 447, 449
 - organic/inorganic hybrid nanocomposite
 - CNT/Polymer *see* Carbon nanotube (CNT)
 - flexible TE module 455
 - formation of 455
 - PANI 458–460
 - PEDOT 455–458
 - polymer matrice 454
 - surface transfer doping 469–472 - organic thermoelectric material 449, 453
 - research and development 447
 - Seebeck effect 445

- thermotropics 308
 Thomson Reuters Web of Science 453
 TiO₂ nanotube (TiO₂-NT) 388
 titanium dioxide nanoparticle (TiO₂ NP) 156
 transmission electron microscopy (TEM) 462, 581
 triethoxysilane (TEA) 497
 trioctylphosphine oxide (TOPO) 8
 trioxatriangulenium (TOTA+) ion pair 174
 4,8,12-tripropyl-4,8,12-triazatriangulenium (TATA+) cation 181
 2D wide angle X-ray scattering (2D-WAXS) 283
 two-dimensional (2D) organic and hybrid porous framework, electronic function
 benzene and triazine aromatic ring, ratio of 427
 BO-based COF 424
 Chern metallic phase 435
 CNFs 425–427, 429, 430, 433
 COFs *see* covalent organic framework (COF)
 CTF 425, 426, 433
 Dirac fermions and unconventional quantum Hall effect 423
 EESD 429, 430
 electrochemical technique 427
 Fe-based material 428
 g-C₃N₄ 430, 432
 graphene 423
 heterogeneous catalyst 430
 heterojunction system 433
 honeycomb lattice systems 423
 hydrogen evolution reaction 424
 lattice-gas model 427
 Lieb-Mielke-Tasaki's flat-band ferromagnetism 435
 lithium battery system 430
 metal-free semiconductor 432
 MOF nanosheet 433
 Nernst equation 427
 OCV 427
 ORR 433
 OTI 435
 oxide nanosheet 423
 PCPs/MOFs 420
 photocatalytic reaction 432
 photoelectron emission spectroscopy 433
 pyrene-based framework 424
 rechargeable battery system 431
 sodium battery technology 430
 Tanabe–Sugano diagram 424
 topological-non-trivial phase 436–438
- U**
 ULH *see* uniform lying helix (ULH)
 uniform lying helix (ULH) 317
 upconversion nanoparticle (UCNP) 94, 96
- V**
 van der Waals interaction 189
 variable-temperature (VT) emission spectroscopy 170
 vehicle mechanism 386, 397
- W**
 whispering gallery mode (WGM) 335
 wide-angle X-ray scattering (WAXS) 174
 World Health Organization (WHO) 486
 wurtzite 487, 489
- X**
 X-ray diffraction (XRD) 169, 250, 254, 260, 578
 X-ray photoelectron spectroscopy (XPS) 494
- Z**
 zone casting 281–283
 zone crystallization technique 283
 zone melting 283–284

