

Index

a

ABC triblock copolymers 136
 adenine-terminated PEO (A-PEO) 154
 α -helix conformation 1
 ammonia-functionalized POSS
 derivative (NH₂-POSS) 344
 amorphous comb-like polymers 62
 amphiphilic low-molecular-weight
 compounds 107
 antisticking applications, PBZs 72, 73
 attractive interaction model (AIM)
 115
 azobisisobutyronitrile (AIBN) 66,
 67
 azopyridine-functionalized PBZ
 derivative poly(AzoPy-BZ)
 75–77

b

BA-a–and BA-m–type benzoxazines
 64
 B-ala benzoxazine monomer 66
 Benesi–Hildebrand equation 256
 benzoxazine monomers 63, 66
 benzoxazines (BZs) 317, 322–330
 BET surface area 206
 bioinspired hydrogen bonding in
 biomacromolecules
 multiple H-bonding interactions in
 DNA *see* multiple H-bonding
 interactions in DNA
 polypeptides *see* polypeptides
 block copolymers
 versus polymer blends
 diblock copolymers 100, 101

 miscible blends 99, 101
 PVPh-*b*-P4VP 99, 100
 PVPh/P4VP blend complexes 98,
 99
 versus random copolymers
 ¹³C NMR spectra of ACA
 copolymers 93, 94
 FTIR spectra of PVPh-*co*-PAS
 copolymers 94, 95
 PVPh-*b*-PMMA block copolymer
 96–98
 PVPh-*co*-PMMA random
 copolymers 96–98
 T_g, of PVPh-*co*-PAS copolymers
 94–96
 block-free copolymers 152–159
 body-centered cubic (BCC) structures
 107
 breath figure method 159

c

carbazole (CBZ) 263
 carboxyl-terminated polybutadiene
 (CPB) 154
 Cassie–Baxter model 78
 cetylpyridinium chloride (CPC) 66
 cetyltrimethylammonium bromide
 [C₁₆H₃₃N(CH₃)₃Br, CTAB]
 167
 circular dichroism (CD) spectra 221
 contact angle (CA) measurements 61,
 62
 corner-capping reactions 289
 C₂₀-POSS/clay 344
 cyclohexane (CHEX) 14

d

- 2,7-diamido-1,8-naphthyridine (DAN) 254
- diaminopyridine (DAP)-functionalized PS (PVB-DAP) 267
- diblock copolymer 101
- diblock copolymer/homopolymer mixtures
 - Hashimoto group 111
- immiscible A–B diblock segments
 - C is miscible with B, but immiscible with A 111–119
 - C is miscible with both A and B 119–126
- miscible A and B diblock segment
 - C is miscible B, but immiscible with A 130–133
 - C is miscible with both A and B 126–130
- diblock top down/bottom-up methods 107
- diiodomethane (DI) 67
- DNA double helix 1
- doxorubicin hydrochloride (DOX) 191

e

- ethylene glycol (EG) 67
- evaporation-induced self-assembly (EISA) 167, 168

f

- Flory lattice model 226
- fluorinated polymers 61
- fluorine–fluorine repulsion 61

g

- gold nanoparticles (Au NPs) 345–348

h

- H-bonded donor polymers 21
- 9-hexadecyladenine (AC-16) 254
- 9-hexadecylthymine (TC-16) 254
- hexamethylenetetramine (HMTA) 200
- highly ordered mesoporous silicas 169
- hole injection/transport material (HITL) 263
- hydrogen bonding

- characterization 3
- inter-chain and intra-chain
 - H-bonding interactions 2
- intermolecular/intramolecular phenomenon 2
- hydroxyethyl cellulose (HEC) 159

i

- inert diluent segment 32
- inter-association equilibrium constant 18
- intramolecular screening effect 21
- IR spectroscopy, hydrogen bonding 14
- 4-isopropylphenol (IPP) 14

k

- Kratky–Porod approximation 129

l

- large compound micelles (LCMs) 140, 143
- Lifshitz–van der Waals method 61
- lotus effect 80
- lower critical solution temperature (LCST) 62, 63
- low surface energy polymers *see* surface energy polymers

m

- Mannich condensations 63
- mercaptopropyl-isobutyl-POSS (SH-POSS) 345
- mesoporous phenolic/carbon materials
 - A–B block copolymers
 - calcination procedures 207, 209
 - miscible phenolic/PEO matrix 203, 206
 - novolac and resol-based materials 197
 - ordered mesoporous polymer
 - resins and carbon 200, 201
 - PEO-*b*-PCL 206–208
 - PEO-*b*-PS 202, 206
 - phenolic/PS-*b*-P4VP 200, 204
 - phenolic/P123 ratio 199, 200
 - PS-*b*-P4VP 200–203
 - resorcinol/PS-*b*-P4VP and CH₂O gas 202, 205

- self-assembly of nanostructures
 - 198
 - triblock copolymer F127 198, 199
- A–B–C triblock copolymers
 - 213–214
- homopolymer blends 207, 210, 211
- mesoporous silica
 - A–B block copolymer
 - diblock copolymer PEO-*b*-PS
 - 171, 173
 - high-molecular-weight PEO-*b*-PS
 - 171, 172
 - PEO-*b*-PCL 173, 180
 - PEO-*b*-PCL diblock copolymers
 - 171, 176
 - PE-*b*-PEO 171, 176
 - PEO₁₁₄-*b*-PLLA₁₃₀ 175, 180
 - PEO-*b*-PLLA diblock copolymers
 - 173, 180
 - PEO125-*b*-PMMA₁₇₄ 171, 175
 - pore sizes 171, 178
 - TEOS/PEO-*b*-PCL ratio 173, 177
 - TEOS/PEO-*b*-PLA ratio 178
 - THF or CH₂Cl₂ 173, 179
 - triblock copolymer F127 169, 170
 - A–B block copolymer/homopolymer blends 179–186, 188
 - cetyltrimethylammonium bromide [C₁₆H₃₃N(CH₃)₃Br, CTAB] 167
 - evaporation-induced self-assembly 167, 168
 - hierarchical porous materials 186, 189–197
 - low-molecular-weight cationic surfactant 167
 - porous materials 167, 168
 - water-soluble systems 167
 - MIPOSS alternating copolymers 307
 - miscible polymer blends 99, 100
 - mono-functional POSS compounds 288, 289–291
 - montmorillonite (MMT) 344
 - multiple H-bonding interactions in
 - DNA 252, 253
 - covalent bonds to supramolecular polymers 252
 - guanine–cytosine (C–G + $K_a = 10^4$ – 10^5 M⁻¹) 252
 - self healing 264–266
 - supramolecular polymers
 - carbon nanotubes 267, 272–274
 - complex biological systems 253
 - DAN units 254, 256
 - double helical 275–281
 - D-PMMA/T-PMMA copolymer 258, 261
 - DSC analyses of
 - D-PMMA/T-PMMA 258, 260
 - ¹H NMR spectra of C16-T/C16-A mixtures 256, 258
 - miscible polymer blends 252
 - optoelectronic 263, 267–272
 - PBMA-*co*-PVBT (T-PBMA) 254, 256
 - PBMA/PS and T₂₄-PBMA/A¹¹-PS blends 254, 257
 - PMMA and
 - D₂₀-PMMA/T₁₂-PMMA binary blends 258, 260
 - PS-*co*-PVBA (A-PS) 254, 256
 - PS/PBMA binary blend 254
 - PVBA/PVBT blend system 254, 255
 - self healing 262–263
 - T-PMBA/A-PS and
 - T-PBMA/VDAT-PS 257, 259
 - UPy dimers 261
 - UPy 261, 262
 - multi-uracil-functionalized POSS (U-POSS) 263, 264
 - multiwalled CNTs (MWCNTs) 85–86

n

 - nanoimprint lithography (NIL) 72
 - nanoparticle systems, POSS
 - clay 344–345
 - gold 345–348
 - MALDI-TOF mass spectra 337, 339
 - microstructures 337, 339
 - OBA-POSS NPs 343, 344
 - OBA-POSS NPs with PS-*b*-PVBT 342

- nanoparticle systems, POSS (*contd.*)
- OP-POSS, OA-POS, and OS-POSS 337, 338
 - PCL-*b*-P4VP 340
 - PCL-*b*-P4VP/OP-POSS blends 340, 341
 - PCL/OP-POSS and P4VP/OP-POSS systems 340
 - PS-*b*-P2VP 341, 342
 - PS-*b*-P2VP/OP-POSS 342, 343
 - PS-*b*-P4VP 341, 342
 - PS-*b*-P4VP/OP-POSS 340, 342, 343
 - PS-*b*-P4VP/OS-POSS hybrids 340, 341
 - PS-*b*-PMMA 341, 342
 - PS-*b*-PMMA/OP-POSS complexes 342, 343
- Nishi–Wang equation 50
- nonadecylphenol (NDP) 109
- noncovalent bonding 1
- noncovalently connected micelles (NCCMs) 154
- O**
- octaazido-functionalized polyhedral oligomeric silsesquioxane (OVBN₃-POSS) 66, 68, 345
- octakis(aminophenyl)-POSS derivative (OAP-POSS) 297, 328
- octaphenol-functionalized POSS derivative (OP-POSS) 296
- oligomeric silsesquioxane 287
- one-dimensional (1D) IR spectra 3
- optoelectronic supramolecular polymers 263–267
- order–disorder transition (ODT) 109
- organic thin film transistors (OTFTs) 265
- P**
- P-*a*-type benzoxazine monomer 65
- PBZ/POSS nanocomposites 321
- pentadecylphenol (PDP) 109
- photoresists systems 335–337
- physical properties, hydrogen bonding
- crystallization behavior 54–56
 - dynamic behavior 51
 - glass transition temperatures
 - negative deviation 48
 - positive deviation 41–48
 - melting temperatures 50–51
- polyacrylonitrile (PAN) 65
- polybenzoxazines (PBZs) 63–67
- AIBN 66, 67
 - antisticking applications 72, 73
 - BA-*a*- and BA-*m*-type benzoxazines 64
 - benzoxazine film formation 65
 - benzoxazine monomers 63
 - clay nanocomposites 66
 - OVBN₃-POSS 66, 68
 - PAN 65
 - superhydrophobic surfaces
 - after plasma treatment 80, 82
 - CNTs 85, 87, 88
 - SiO₂ hybrid 81–86
 - surface properties of 73–77
- poly(γ -benzyl-L-glutamate) (PBLG) 219
- poly(bromophenyl methacrylamide) (PBPMA) 23
- polycarbonate (PC) 258
- polydimethylsiloxane (PDMS) 61
- poly(4-ethenylphenolmethylsiloxane) (PEPS) 24
- polyhedral oligomeric silsesquioxanes (POSS) 287
- polyimide (PI) 323–335
- polymer blends 227
- absorptivity coefficient, of IPP 16
 - association model approach 12–14
 - block/graft copolymers 9
 - bulky group effect 25
 - characterization 29
 - DSC analysis 34
 - functional group accessibility 21
 - H-bond acceptor polymers 24
 - H-bond donor polymers 23–24
 - H-bonded polymer blends 13
 - H-bonding functional group incorporation 30
 - incompatible and immiscible 9
 - inert diluent segment 32–33
 - interfacial tension 9

- intermolecular/inter-association
 - H-bonding 17
- intramolecular screening effect 21
- local and long-range screening effects, polymer chain 22
- microphase separation 9
- miscibility behavior 10
- miscibility characterization 28–30
- morphologies of 10
- phase behaviors 9
- phenolic/PMMA-POSS blend 26
- physical properties 9
- PVPh-co-PMMA/PEO binary blend 27
- reactive compatibilization 9
- self-association equilibrium constants 14–17
- solvent effect 28
- steric hindrance 25
- temperature effect 26
- ternary polymer blends 33–36
- thermodynamic properties 10–12
- polymethacrylamides 23
- poly(methoxyphenyl methacrylamide) (PMPMA) 23
- poly(*N*-isopropylacrylamide) (PNIPAm) 62, 311–312
- polypeptides 219
 - hierarchical structures of proteins 219, 220
 - natural and synthetic polymers 219, 220
 - secondary structure of
 - α -helical conformation 219, 221, 224
 - β -sheet conformation 219, 221
 - CD spectroscopy 225, 226
 - FTIR spectra of PBLG polymers 221–223
 - self-assembled structures *see* self-assembled structures, polypeptide
 - solid state NMR spectra 222, 223
 - WAXD analyses 224, 225
- polysilsesquioxanes 287, 288
- polytetrafluoroethylene (PTFE) 61
- poly(vinyl acetate) homopolymer (PVAc) 93
- poly(vinyl alcohol-co-vinyl acetate) (ACA) copolymers 93, 94
- poly(vinylbenzyl)thymine (PVBT) 109
- poly(vinylidene difluoride) (PVDF) 241
- poly(vinyl phenol) (PVPh)
 - CAs for 67, 69
 - fractions 70
 - free and intra- and intermolecularly H-bonded PVPh homopolymers 69, 71
 - FTIR spectra of 67, 70
 - H-bonding donor polymer 67
 - PVPh/PBZ copolymers 70–72
- poly(vinyl phenol-co-acetoxystyrene) (PVPh-co-PAS) copolymers 93
- poly(4-vinylpyridine) (P4VP) 109
- POSS-containing methacrylate-based photoresists 337
- POSS nanocomposites
 - bifunctional compounds 289, 298
 - H-bonding interaction
 - nanoparticle systems *see* nanoparticle systems, POSS
 - phenolic derivatives 297–305
 - photoresists 335–337
 - PNIPAm 311–312
 - polybenzoxazine 317–323
 - polyimide 323–335
 - polypeptide 312–317
 - PVPh derivative systems 306–311
 - H-bonding of polymer 292–296
 - mono-functional compounds 288, 289–291
 - multifunctional compounds 292, 293, 298
 - nanostructures 287
 - polysilsesquioxanes 287, 288
 - siloxane (Si–O) linkages 288
 - silsesquioxanes 287, 288
- PVPh-co-PAS copolymers 94, 95
- PVPh/P4VP polymer blend system 98
- P4VP/NDP complex 110
- P4VP/PDP 109, 111

r

reactive ion etching (RIE) 335

s

self-assembled structures of block

copolymers

in bulk state

attractive and repulsive interactions

107, 108

in bulk state diblock

copolymer/homopolymer 112

diblock copolymer/homopolymer

mixtures *see* diblock top

down/bottom-up methods

diblock copolymers 133–140

low-molecular-weight compounds

109–111

top-down/bottom-up methods

108

volume fractions 107, 109

in solution

copolymer/homopolymer mixtures

111, 145–147

diblock copolymer mixtures

147–152

LCMs 140, 143

low-molecular-weight compounds

141, 145–147

low-molecular-weight surfactants

140

micelle structures 143

noncovalently bonded micelles

152–159

self-assembled structures, polypeptide

226

block copolymers 244–252

C=O groups of PMLG 243

¹³C solid state NMR spectroscopy

231

Flory lattice model 226

fractions of H-bonded C=O groups

228, 229

FTIR spectra, 227–229

PAS/PBLG, and PS/PBLG 232

PAS/PBLG blend 234

PAS/PVPh binary blends 234

PBLG blend systems 227

PBLG fiber electrode 242

phenolic/PBLG blends 231

PMLG and PVDF 243, 245

PMLG, PELG, and PBLG 230–232

PMLG/PVDF piezoelectric fiber

energy 243, 244

poly(glutamic acid) 227

PS-*b*-P4VP/PTyr blend 237, 238

PS/PBLG blend 234

PTyr/P4VP blends 235–238

PTyr/PMGL blends 240, 241

PVPh/PBLG and phenolic/PBLG

blend systems 228

PVPh/PBLG, PAS/PBLG, and

PS/PBLG 232, 233

PVPh PVPh/P4VP system 235

PVPh/P4VP system 235

pyridine-PTyr/P4VP blend 237,

239

self-association equilibrium constants

14–17

separated coils versus chain aggregates

A-b-B/C-b-D diblock copolymers

102

PS-*b*-PVPh/PMMA-*b*-P4VP diblock

copolymer 104

PS-*b*-PVPh/P4VP-*b*-PMMA mixture

102–104

PVPh/P4VP diblock mixtures 105

supramolecular structures 102

silsesquioxanes 287, 288

small-angle X-ray scattering (SAXS)

109

solid state NMR spectroscopy 5, 56

solvent effect 28

superhydrophobic surfaces 78

artificial methods 80

Cassie–Baxter model 78, 80

fabrication processes 78

inexpensive materials 78

lotus effect 80

PBZ after plasma treatment 80,

82

PBZ/CNT hybrid 85, 87, 88

PBZ/SiO₂ hybrid 81–86

WCAs 78

Wenzel model 78

- surface energy polymers 61
 - amorphous comb-like polymers 62
 - base interactions 61
 - CA measurements 61, 62
 - fluorine–fluorine repulsion 61
 - LCST 62, 63
 - Lewis acid 61
 - Lifshitz–van der Waals method 61
 - PBZs *see* polybenzoxazines (PBZs)
 - PNIPAAm 62
 - PTFE and PTFE 61
 - PVPh 67, 69–72
 - two-liquid mean method 62
 - t**
 - ternary polymer blends 33–36
 - tetraethyl orthosilicate (TEOS) 169
 - thermoplastic supramolecular polymeric elastomers 259–262
 - three-arm PCL oligomer (A-PCL) 263
 - time-temperature superposition principle (TTS) 51
 - triphenylamine (TPA) 263
 - two-dimensional (2D) correlation spectroscopy 3
- u**
 - Ubbelohde viscometer 258
 - 2-ureido-4[1*H*]-pyrimidinone (UPy) dimers 261
 - 2-ureido-4-pyrimidinone methyl methacrylate (UPyMA) monomers 262
- v**
 - vinyl benzyl adenine (VBA) 254
 - vinyl benzyl thymine (VBT) 254
 - 2-vinyl-4,6-diamino-1,3,5-triazine monomer (VDAT) 256
- w**
 - water contact angle (WCA) 62, 80
 - water-insoluble amphiphilic block copolymers 167
 - water repellency materials *see* superhydrophobic surfaces
 - Watson–Crick base pairs 275
 - Wenzel model 78, 80
- x**
 - X-ray photoelectron (XPS) spectroscopy 3

