

Index

a

AB₂ Y-shaped star copolymers 243
 acid phosphatase (AP) 207
 aerogels 265
 agarose 164
 albumin 166
 alginate hydrogels 177
 aliphatic polyesters 6
 alumino-siloxane gels 273
 amperometric acetylcholinesterase (AChE) biosensors 56
 amperometric biosensors 52
 amperometric glucose biosensor 59
 antibacterial coatings 106
 anti-cancerous drug doxorubicin 287
 antimicrobial activity of plasma 94

b

β-calcium metaphosphate (BMP) 373
 β-glucans 333
 beta-tri calcium phosphate (β-TCP) 323
 biodegradable polyesters 6
 biodegradable polymers
 – classification of 363
 – definition 361
 – natural, *see* natural biodegradable polymers
 – properties 303
 – synthetic, *see* synthetic biodegradable polymers
 bioelectrodes 50
 biologically responsive polymer
 – enzyme-responsive polymers 207
 – glucose responsive polymer 208
 biological-machine systems integration (BMSI) 50
 biomedical applications
 – biomedical product development 1
 – bone repair 9

– drug delivery systems 4
 – guided tissue response 2
 – heart valves and arteries 7
 – polymer hydrogels 2
 – prevention of cellular activity 2
 – tissue-engineering applications 1
 biomimetic hydrogel 3
 biotechnology 92
 borax 152
 bovine serum albumin (BSA) 337
 brain–computer interfaces (BCIs) 51

c

calcium phosphate 307
 calcium phosphate (CaP)-based biomaterials 10
 carboxybutyl chitosan 171
 2-carboxyisopropylacrylamide (CIPAAm) 190
 carboxymethyl chitosan 170
 carrageenans 307–308
 casein 336
 casein micelles (CM) 339
 CdS nanoparticle-capped mesoporous silica-based drug/neurotransmitter delivery system 285
 cell encapsulation and soft tissue replacement 2
 cellulose 306
 chemical gas sensors 59
 chemical gels 142
 chemical hydrogels 128
 chemiresistor sensors 59
 chitosan 166, 305
 chitosan-based scaffolds 176
 chitosan with phenolic hydroxyl groups (Chit-Ph) 169
 cholesterol biosensors 60

- cigarette smoke detector 55
- cochlear implant 50
- collagen 307, 319
- colloidal gels 268
- colloidal metal-oxide gels 272
- complement receptor-3 (CR3) 333
- conducting polymers (CP) 129
 - brain recording 69
 - cardiovascular applications 68
 - chemical and electrochemical polymerization methods 28
 - cytotoxicity assessment 38
 - dispersion 37
 - drug delivery system 39
 - electrically conducting biomaterials 65
 - electrical property modification 29
 - electrochemical method 22
 - electrochemical polymerization 28
 - electrode coating 49
 - electronic and optic properties 25
 - glucose biosensor 22
 - high-performance biosensing and cellular interfacing 38
 - *in-vitro* cell culture 63
 - mechanical property modification 30
 - nanodots 64
 - nanomaterials 38
 - poly(carbazole) 27
 - poly(para-phenylene vinylene) (PPV) 26
 - polyacetylene 22
 - polyaniline (PANI) 22, 27
 - polythiophene (PT) 26
 - scaffolds 70
 - water soluble polyelectrolyte precursor 22
- conjugated polymers 132
- copolymer hydrogels 145
- corrosion resistant and low wear coatings 108
- cryogels 265
- curdlan 333

- d**
- degree of deacetylation 304
- dendritic polyesters 245
- dermatan sulfate (DS) 313
- dialdehyde heparin (DHP) 322
- dialdehyde starch (DAS) 322
- diamond like carbon (DLC) films 103
 - antibacterial coatings 106
 - corrosion resistant and low wear coatings 108
 - efficacy 111
 - haemocompatible coatings 104
- dielectric elastomer generators (DEGs) 136
- dielectric elastomers (DEs) 135
- 1,4-dihydroxyanthraquinone (DHA) 322
- dilatant gels 266
- direct-charge transfer biosensor 61
- divinyl ether-maleic anhydride (DIVEMA) 173
- DLC coated metallic metatarsophalangeal (MTP) prosthesis 111
- dopamine 55
- drug delivery system
 - hydrogel-type compounds 40
 - hydrophobic medicines 41
 - neural probes 40
 - polymeric microspheres 40
 - release and diffusion 42
 - targeting and delivery 44
- drug delivery systems 4
- dual stimuli-responsive (SR) polymers
 - pH and magnetic-responsive polymers 212
 - pH and redox-responsive polymers 211
 - thermo-and light-responsive polymers 213
 - thermo-and pH-responsive polymers 210
 - thermo-and redox-responsive polymers 212

- e**
- elastic gels 264
- electrically conducting biomaterials 65
- electro-active polymers (EAPs)
 - conducting polymers (CP) 129
 - conjugated polymers 132
 - dielectric elastomers (DEs) 135
 - ionic polymer-metal composites 131
 - large motion sensors 125
 - piezoelectric and electrostrictive polymers 133
 - polymer gels 126
 - potential sensors 125
 - sensing and actuating behavior 125
 - types 126
- electrochemical impedance spectroscopy (EIS) analysis 372
- electrode coating 49
- electrospun isolated PANI-CSA nanofiber sensors 59
- emeraldine polymer 24
- enzyme-responsive polymers 207

- f**
- fast and sensitive continuous-flow nanobiodetector 61
- finely tuned nanovalves 283

FlatPlaSter 2.0, 94
 5-fluorouracil (5-FU) 244
 foodborne pathogen detection 53
 Förster resonance energy transfer (FRET)
 307

g

gelatin 319
 gellan gum 326
 gels 261
 glucose-responsive hydrogels 154
 glucose responsive polymers
 – DMAEMA 208
 – PEG 209
 glutaraldehyde 244
 glycosaminoglycans (GAGs) 311
 graphene-based nanomaterials 112
 growth factor (GF) 321
 guided bone regeneration (GBR) 305

h

half N-acetylated chitosan 169
 heparan sulfate (HS) 312
 high amylase corn starch (HACS) 321
 homogalacturonan (HGA) 317
 homopolymer hydrogels 145
 human serum albumin (HSA) 321
 hybrid MSNs 295
 hydrogels 128
 hydrogels/aquagels 263
 hydrogen sensors 58
 hydrolysis 269
 hydrolytic degradation stability 365
 hydrophilic polymers
 – applications 175
 – natural 164
 – semi synthetic 166
 – synthetic 171
 hydrophobically modified chitosan (hmC)
 373
 hydroxyapatite (HA) 323
 hydroxyethyl cellulose (HEC) 167
 hydroxyethyl methacrylate (HEMA) 192
 hydroxypropyl chitosan (HPCTS) 169
 hydroxypropyl methylcellulose (HPMC) 167

i

inorganic metal-oxide gels
 – hybrid nanoarchitectures 267
 – sol–gel synthesis 267
 interpenetrating polymeric hydrogels 145
 inulin 164
 ionic polymer-metal composites (IPMC) 131
 ion responsive hydrogels 154

k

keratin sulfate 314

l

light-responsive polymers 213
 linear polysaccharide 304
 lipase/glutaraldehyde/PANI-NT/ITO
 bioelectrode 60
 lower critical solution temperature (LCST)
 190, 192, 195, 198, 210, 212–216
 low molecular weight drug 242
 low molecular weight organic gelators
 (LMWGs) 262
 low-temperature plasma 93
 luminescent organic dyes 287

m

magnetic field responsive polymers
 – PNIPAM 198
 magnetic resonance imaging (MRI) 289
 mechanical stress 202
 meso-channeled alumino-siloxane aerogels
 282
 metal-on-metal metatarsophalangeal (MTP)
 prosthesis 111
 metal-oxide aerogels 269, 277
 metal-oxide xerogels 276
 methyl methacrylate (MMA) 204
 microbial transglutaminase (MTGase) 337
 MiniFlatPlaSter 94
 multi-armed
 poly(aspartate-graft-oligoethylenimine)
 (MP-g-OEI) copolymers 376
 multicomponent/mixed-oxide aerogels 270
 multipolymer hydrogels 145
 multi stimuli responsive (SR) materials
 – environmental-, pH-and
 temperature-responsive polymers 215
 – light-, pH-and temperature responsive
 polymers 214
 – light-, redox-and temperature-responsive
 polymers 215
 – magnetic, pH and redox-responsive
 polymers 217
 – redox, pH, temperature responsive polymers
 216
 – temperature, pH, magnetic responsive
 polymers 217

n

nafion-based IPMCs 132
 nanobiodetector 61
 nanogapped microelectrode-based PANI-NF
 biosensor array 60

- nanogels 244
- natural and synthetic polymers 5
- natural biodegradable polymers 303
 - carrageenans 307
 - casein 336
 - cellulose 306
 - chitosan 305
 - collagen 307
 - curdlan 333
 - dermatan sulfate (DS) 313
 - GAGs 311
 - gelatin 319
 - gellan gum 326
 - heparan sulfate (HS) 312
 - heparin (HP) 311
 - keratin sulfate 314
 - pectin 317
 - silk 340
- natural hydrophilic polymers
 - animal origin 165
 - plant origin 164
- natural tissues 7
- nerve growth factor (NGF)-loaded porous conducting polymers 66
- newtonian material 265
- next-generation biosensors 55
- N*-[(2-hydroxy-3-trimethylammonium)propyl]chitosan chloride (HTCC) 169
- nitric oxide (NO) 371
- N,N*-dimethylaminoethyl methacrylate (DMAEMA) 208
- non-newtonian material 265
- non-reversible/chemical gel 262
- o**
- oligo(ethylene glycol)-based polymers 196
- oligoethylenimine (OEI) 376
- organogels 263
- organophosphates 56
- orthopaedic implants 108
- oscillating gel system 127
- p**
- p*-Aminophenol (*p*-AP) 54
- PANI-CSA-Ni composite nanowire 55
- pectin 317
- PEG–polyester copolymer hydrogels 150
- pH 203
 - and magnetic-responsive polymers 212
 - poly(L-lysine) 205
 - polyacrylic acid (PAA) 204
 - polysulfonic acid 205
 - and redox-responsive polymers 211
 - and thermo-responsive polymers 210
- phosphate buffered saline (PBS) 190
- photodynamic therapy (PDT) 290
- pH responsive polymers 249
- pH sensitive gels 153
- physical cross-linked self-assembling gels 271
- physical gels 142
- physically cross-linked inorganic and hybrid gel 271, 278
- piezoelectric and electrostrictive polymers 133
- plasma-assisted surface modification 96
- plasma-enabled synthesis of polymers 101
- plasma enhanced chemical vapor deposition (PECVD) 104
- plasma-enhanced synthesis of graphene and carbon nanoparticles 112
- plasma functionalization 99
- plasma induced grafting process 102
- plasma lithography technology 98
- plasma polymerization process 99
- plasma sterilization 93
- plasma treatment 95
- plastic gels 266
- PNIPAM-grafted gelatin (PNIPAM–gelatin) 191
- poly(α -hydroxy acids) 363
- poly(β -amino esters) 374
- poly(γ -benzyl l-glutamate) (PBLG)
- poly(2-hydroxyethyl methacrylate) (HEMA) 147
- poly(3-hexylthiophene) (P3HT) 68
- poly(4-hydroxy-l-proline ester) 374
- poly(acrylamide) (PAAM) 171
- poly(acrylic acid) (PAA) 172
- poly(carbazole) 27
- poly(diethyl vinylphosphonate) (PDEVP) 194
- poly(ethacrylic acid) (PEA) 205
- poly(ethylene glycol dimethacrylate) (PEGDMA) 148
- poly(ethylene oxide) (PEO) 148
- poly(hydroxyethyl methacrylate) (polyHEMA, PHEMA) 128
- poly(L-lysine) 205
- poly(lactic acid-co-glycolic acid) (PLGA) 196
- poly(*N*-alkyl methacrylamides) 195
- poly(*N*-isopropylacrylamide) (PNIPAM) 126, 175, 198, 199, 206, 242
- poly(*N*-substituted α/π -asparagine) 197
- poly(*N*-vinylcaprolactam) (PVCL) 195
- poly(*N*-vinylisobutyramide) (poly(NVIBA)) 194
- poly(oligoethylene glycol methacrylate) (POEGMA) 149

- poly(ortho esters) (POEs) 368
poly(oxazoline) (POZ) 174
poly(para-phenylene vinylene) (PPV) 26
poly(propyl acrylic acid) (PPA) 205
poly(propylene fumarate) (PPF) 369
poly(vinyl alcohol) (PVA) 175
poly(vinyl pyrrolidone) (PVP) 150, 174
poly(vinylidene fluoride) (PVDF) 134
polyacetals 369
polyacetylene 22
poly(lactic-co-glycolic) acid (PLGA) 365
polyacrylic acid (PAA) 204
poly(ethylene oxide) and poly(propylene oxide) triblock copolymer 148
polyanhydrides (PAs) 367
polyaniline (PANI) 22, 27
polycaprolactone (PCL) 366, 371
polycarbonates 369
polycationic polymers 249
poly(amidoamine) (PAMAM) dendrimer – drug 246
polydimethylsiloxane (PDMS) 200, 201
polydioxanones (PDS) 8
polyesters 363
polyethylene glycol (PEG) 128, 207, 209
polyethylenimine (PEI) 375, 376
polyglycolic acid (PGA) 364
poly(*N*-isopropylacrylamide)-grafted hyaluronan (PNIPAM–HA) 191
poly(vinyl alcohol) (PVA) hydrogel 151
poly(acrylamide) (PAAm) hydrogels 145
poly(acrylic acid) (PAA) hydrogels 147
poly(*N*-isopropylacrylamide) (PNIPAM) hydrogels 146
polyhydroxyalkanoates 368
polyisobutylene (PIB) 3
polylactide (PLA) 364
polylysine (PLL) 374
polymeric gels 268
poly(ethylene glycol) methacrylate (PEGMA) 148
poly[*N*-(2-hydroxypropyl) methacrylamide] (PHPMA) 173
poly[(organo)phosphazenes] 172
polyorthoesters (POEs) 6
polypeptide hydrogels 152
polyphosphazenes 5, 367
polyphosphoesters 370
poly(ethylene glycole)-poly(ethylene glycol methacrylate) (PEG-PEGMA) 148
poly(ethylene oxide) (PEO)/poly(ethylene glycol) (PEG) 172
poly(ethylene glycol)-poly(ϵ -caprolactone)-poly(ethylene glycol) (PEG-PCL-PEG)(PECE) 149
polypyrrole (PPy) 129
polysulfonic acid 205
polytetrafluoroethylene (PTFE) 10
polythiophene (PT) 26
polyurethanes (PU) 7, 366
polyvinylidene difluoride (PVDF) 133
positron emission tomography imaging (PET) 291
potential pulse amperometry technique 60
 γ -coated poly(lactic-co-glycolic acid) (PLGA)I 63
 γ -polyurethane (PU) nanocompositesI 63
protein fouling 98
proteoglycans (PGs) 311
pseudoplastic gels 266
- r**
red fluorescent protein (RFP) 376
redox-responsive polymers 212
redox stimulus 211
resistant starch 322
resistive barrier discharge (RBD) plasmas 94
reversible gels/physical gel 262
rigid gels 264
rotaxane molecules 283
- s**
scaffolds 9, 70
semi synthetic hydrophilic polymers
– carboxybutyl chitosan 171
– carboxymethylchitosan 170
– chitosan – PEG hybrid 168
– chitosan with phenolic hydroxyl groups (Chit-Ph) 169
– half *N*-acetylated chitosan 169
– hydroxyethyl cellulose 167
– hydroxypropyl chitosan (HPCTS) 169
– hydroxypropylmethyl cellulose (HPMC) 167
– *N*-[(2-hydroxy-3-trimethylammonium) propyl]chitosan chloride (HTCC) 169
– sodium carboxy methyl cellulose (Na-CMC) 168
sensitive electrochemical DNA biosensors 60
sensitive glucose biosensor 59
sensitive H₂O₂ biosensors 60
serum albumin 166
silica-based hybrids and ordered mesoporous materials 280
silk 340

- silk fibroin (SF) nanofiber-based scaffolds 68
- silk like polypeptides (SLPs) 340, 341
- single component aerogels 270
- smart materials 281
- smart polymer hydrogels
 - glucose-responsive hydrogels 154
 - ion responsive hydrogels 154
 - pH sensitive gels 153
 - thermoreversible gels 153
- sodium carboxy methyl cellulose (Na-CMC) 168
- sol–gel derived hybrid metal-oxides nanostructures 273
- sol–gel derived inorganic and hybrid nano-architectures 275
- sol–gel derived inorganic gels 295
- sol–gel derived mesoporous silica 282, 286
- sol–gel matrices
 - targeted cancer therapy 286
- sol–gel metal-oxide gels 295
- sol–gel matrices
 - magnetic resonance imaging 289
 - metal-oxide aerogels 277
 - metal-oxide xerogels 276
 - photodynamic therapy 290
 - physically cross-linked inorganic and hybrid gel 278
 - positron emission tomography imaging 291
 - silica-based hybrids and ordered mesoporous materials 280
- solvent 200
- stimuli-responsive (SR) drug delivery systems 282
- stimuli-responsive (SR) polymers
 - advantages and limitations 234
 - classification of biomedical application 233
 - enzyme-responsive polymers 207
 - fluorescence reflectance imaging 237
 - fluorescent DNA probe 238
 - fluorescent polymeric sensors 240
 - ^{19}F magnetic resonance imaging 236
 - gene delivery 247
 - glucose responsive polymers 208
 - holographic time-gating technique 235
 - localized surface plasmon resonance (LSPR) 238
 - low molecular weight drug 242
 - magnetic field 198
 - mechanical stress 202
 - molecular imaging 237
 - multi stimuli responsive (SR) materials 213
 - near infrared 235
 - optical glucose-sensor 239
 - pH 203
 - pNIPAM actuators 236
 - PNIPAM microgels 239
 - polymeric sensors 238
 - pressure 197
 - proteins and enzymes delivery 249
 - rolling circle amplification 238
 - solvent 200
 - surface plasmon resonance spectroscopy (SPR) 238
 - visualized fluorescent images 235
- stimuli responsive (SR), smart/intelligent hydrogels 142
- streptavidin 102
- surface endothelialisation 103
- surface topographies 98
- synthetic biodegradable polymers 361, 371
 - poly(ϵ -caprolactone) 366
 - poly(glycolide) (PGA) 364
 - poly(ortho esters) (POEs) 368
 - poly(propylene fumarate) (PPF) 369
 - polyacetals 369
 - poly(lactic-co-glycolic) acid 365
 - polyanhydrides (PAs) 367
 - polycarbonates 369
 - polyesters/poly (α -hydroxy acids) 363
 - polyhydroxyalkanoates 368
 - polylactide 364
 - polyphosphazenes 367
 - polyphosphoesters 370
 - polyurethanes (PU) 366
- synthetic hydrophilic polymers
 - divinyl ether-maleic anhydride 173
 - poly(acrylamide) 171
 - poly(acrylic acid) 172
 - poly(*N*-isopropylacrylamide) (PNIPAM) 175
 - poly(oxazoline) (POZ) 174
 - poly(vinyl alcohol) (PVA) 175
 - poly(vinyl pyrrolidone) (PVP) 174
 - poly[*N*-(2-hydroxypropyl) methacrylamide] 173
 - poly[(organo)phosphazenes] 172
 - poly(ethylene oxide)/poly(ethylene glycol) 172
- synthetic polymer hydrogels
 - applications 155
 - chemical cross-linking 144
 - chemical gels 142
 - copolymer hydrogels 145
 - copolymerization/cross-linking free-radical polymerizations 143
 - glucose-responsive hydrogels 154

- homopolymer hydrogels 145
- interpenetrating polymeric hydrogels 145
- ion responsive hydrogels 154
- multipolymer hydrogels 145
- PEG–polyester copolymer hydrogels 150
- pH sensitive gels 153
- physical cross-linking 143
- physical gels 142
- poly(2-hydroxyethyl methacrylate) 147
- poly(ethylene glycol dimethacrylate) 148
- poly(ethylene glycol methacrylate) 148
- poly(ethylene oxide) (PEO) 148
- poly(oligo ethylene glycol methacrylate) 149
- poly(vinyl pyrrolidone) 150
- poly(ethylene oxide) and poly(propylene oxide) triblock copolymer 148
- poly(vinyl alcohol) hydrogel 151
- poly(acrylamide) hydrogels 145
- poly(acrylic acid) hydrogels 147
- poly(*N*-isopropylacrylamide) (PNIPAM) hydrogels 146
- polypeptide hydrogels 152
- poly(ethylene glycole)-poly(ethylene glycol methacrylate) 148
- poly(ethylene glycol)-poly(ϵ -caprolactone)-poly(ethylene glycol) (PEG-PCL-PEG)(PECE) 149
- radiation cross-linking 144
- swelling behaviour 154
- thermoreversible gels 153
- synthetic poly(carbonate urethane) valves 7

t

- temperature-responsive polymers
 - oligo(ethylene glycol)-based polymers 196
 - PDEVP 194
 - poly(*N*-alkyl methacrylamides) 195
 - poly(*N*-substituted α/π -asparagine) 197
 - poly(NVIBA) 194
 - PVCL 195
- temperature sensitive polymers 283
- ternary oxide aerogels 270
- thermoreponsive diblock copolymers 248
- thermo responsive polymer 250
- thermoreversible gels 153
- thermo-sensitive drug delivery hydrogel systems 244
- thixotropic gels 267
- tissue-engineered synthetic chordae 7

u

- ultrafast sensor 59
- ultrasensitive electrochemical DNA biosensor 60

v

- vicryl (polyglactin 910) 8
- vision prosthesis 51

w

- water based gels 263

x

- xerogels 264

