

Index

a

- Achilles heel of membrane processes 364
- acrylamide (AAm) 190, 230, 243, 245, 247, 248, 385
- acrylamide-*co-N,N*-methylenebisacrylamide 284
- acrylic acid (AA) 45, 57, 81, 87, 89–91, 93, 94, 110, 114, 188, 224, 230, 231, 242, 244, 250, 257, 260, 284, 382–385
- acrylic hydrogels 302
- actinometry 86
- activation energy for diffusion (E_D) 148, 150
- activation enthalpy for diffusion (ΔH_D) 145
- “activation-initiation” grafting mechanism 58
- adhesion improvement 43–47
- adhesion property 68, 348, 379
- adsorption methods 352
- adsorption theory 44
- aging 59, 60, 69, 77, 123, 351, 365, 401
- AIBN-bearing silanes 275
- AIBN type-functionalized quaternary ammonium 275
- albumin 320, 321
- alginate 320–321
- 3-allyl-5,5-dimethylhydantoin (ADMH) 387, 389
- alternating copolymers 108, 123
- amide bond 325, 326, 358
- aminolysis
PET 216
- PMMA 216–217
- poly(ϵ -caprolactone) (PCL) 215–216
- polylactic acid 213–214
- aminopropylsilane (APS) 298, 353
- 3-aminopropyltriethoxysilane (APS) 353
- Amonton’s first law 173
- amphiphilic block copolymers 323, 379
- anthraquinone 166, 251, 253, 256, 260, 277
- anthraquinone-2-sulfonate sodium salt 277
- antibacterial drug releasing materials 262
- antibiofouling behaviour 124, 125
- antibodies 332–333
- anti-CD63 antibodies 326
- anti-inflammatory and antibacterial polymeric implants 273
- aptamers 260, 329, 332
- Aquala[®] technology 174
- aramid powder 250
- aromatic polyamide (PA) 265, 364
- aromatic polyamide membranes 265
- Ar plasma-treated nanofibers 55
- Arrhenius plot of diffusivity 150
- asialoglycoprotein receptor (ASGPR) 334
- atmospheric pressure plasma jet (APPJ) 40–41, 52
- atomic layer deposition (ALD) 370
- cellulose 140–141
- chemical mechanisms 138–139

- atomic layer deposition (ALD) (*contd.*)
 coated cotton fibers 143–145
 electrically conductive coatings 144
 polyvinyl alcohol 140
 protecting polymers from
 degradation 144
 semiconductor manufacturing 138
 unreactive polymer substrates
 141–143
 vapor barriers 144
 vs. vapor phase infiltration
 135–156
- avalanche townsend discharges 35
- 4-azidophenylcarbonyloxyethyl-2-
 bromoisobutyrate (AzEBI) 171
- 2,2'-azobis[2-(2-imidazolyl-N-2-yl)
 propane] 250
- azobisisobutyronitrile (AIBN) 275
- azo compounds 241, 249–250
- azoisobutyrylnitrile (AIBN) 250
- b**
- batch deposition technique 128
- “beer bottle cap” concept 14
- benzoin 166, 168, 169, 230, 275, 277
- benzoin dianion 230
- benzoin-functionalized multiwalled
 carbon nanotubes (MWCNTs)
 275
- benzoin-functionalized polymers 275
- benzophenone (BP) 127, 166, 172, 230,
 261, 274, 277, 278, 280, 391
- biaxially oriented polypropylene
 (BOPP) 45, 248, 282
- bifunctional *N,N'*-methylenebis
 (acrylamide) 248
- binary graft copolymers 191
- biodegradable and biobased polymers
 347, 358
- biodegradable polymers 49, 53–56,
 213, 235, 320–323, 351, 356
- biodegradables aliphatic polyesters
 356
- biofoulant 124
- bio-inspired polydopamine (PDA)
 coating 235
- biological polymer surface modification
 354–355
- biopolymers 303, 321, 402, 412
- 3,5-bistrifluorobenzylamine 226
- 3,5-bis-trifluoromethylbenzene
 diazonium cation 254
- $\beta(1\rightarrow4)$ linked D-glucose units 217
- block co-polymers (BCPs) 4, 16, 123,
 152, 153, 190, 196, 323, 379, 391,
 392
- Boltzmann constant 33
- 2-bromoisobutyrate compounds 171
- Brownian nanoparticles 337
- Brunauer-Emmett-Teller (BET)
 adsorption isotherm 110
- butylmethacrylate (BMA) 248
- n*-butylmethacrylate (BMA) 248
- 1-butyl-3-methylimidazolium
 hexafluorophosphate,
 [bmim]PF₆ 295
- c**
- camphorquinone (CQ) 279, 281
- capacity coupled plasma (CCP) 351
- carbenes 167, 241–268
- carbonaceous PTFE 231
- carbon based nanomaterials 410
- carbon-fiber 174, 175
- carbon nanotubes 12, 68, 118, 119,
 122, 123, 127, 275, 303, 364,
 410
- carbon quantum dots 364
- 4-carboxy benzenediazonium salt 254
- carboxylated CNCs 219
- cardo polyetherketone 224
- catalytic hybrid metal-polymer
 membranes 369
- cation exchange membranes 258
- cationic grafting 192, 193
- cationic polymeric nanoparticles 338
- cellobiose (β -1,4-glucosidic dimer) 219
- cell-penetrating peptides (CPP's) 333,
 338
- cell-targeting peptides (CTP's) 333
- cellulose 136, 140, 217–220
- cellulose nanocrystals (CNC) 219

- cetyltrimethylammonium bromide (CTAB) 323, 353
 $(\text{CH}_2)_2\text{C}_6\text{F}_{13}$ 262
 chain transfer agent (CTA) 193
 charged molecules 5
 chemical bonding 44, 46, 56, 71, 72, 74, 83, 96, 108, 127, 164, 178, 188, 301, 329, 375
 chemical mechanisms 138
 of ALD 138–139
 chemical oxidation
 natural polymers 234
 PET 234
 PMMA 233
 polyethylene 231–233
 polypropylene 231
 polystyrene 233
 polyurethane 233–234
 chemical reaction theory 44
 chemical reduction
 PET 225–227
 PMMA 227
 polyaryletheretherketone 220–224
 polycarbonates 227–229
 polytetrafluoroethylene 229–231
 chemical vapor deposition (CVD)
 techniques 370
 chitosan 51, 53, 55, 57, 58, 187, 196, 216, 218, 234, 235, 244, 321, 330, 335, 355, 376
 chitosan (CS) nanofibers 55
 chitosan/PEO nanofibers 55
 chloramine 224
 click reaction 121, 327, 331, 335
 ^{60}Co 186, 196, 206, 385
 coated cotton fibers 143
 cold low-pressure plasmas 85
 cold plasmas 70, 214, 351, 355–357
 competitive ablation and polymerization (CAP) 74
 completely ionized plasma 34
 conducting polymers 154–155, 250–252, 287
 configurational entropy 2
 confined photocatalytic oxidation (CPO) 247, 248
 conformality for iCVD coatings 112
 conjugated monomers
 origin of the phenomenon and mechanism of polymer synthesis 298
 polyaniline 294–298
 polypyrrole 290–294
 contact angle hysteresis 13, 120
 copolymerization 16, 110, 111, 120, 123, 126, 224, 303, 385, 387, 389, 391
 copolymers of maleic anhydride 166
 copper(Cu-I)-catalyzed alkyne-azide cycloaddition (CuAAC) 327
 cotton 140
 gauzes 196
 Coulomb-type collisions 34
 covalent
 conjugation 325, 326, 328
 crosslinking 198, 374
 grafting 130, 266, 379, 393
 crosslinked hydrogels 199
 crosslinked poly(vinyl alcohol) (PVA)
 ultrafiltration membranes 372
 crosslinkers 116, 119, 123, 124, 126, 201, 266, 330, 383
 crosslinking 43
 with additives 200–201
 gamma ray modifications 199–200
 industrial applications 201–202
 vulcanization 197–198
 crystalline morphology 2
 ^{137}Cs 186
 Cu NPs 375
 CVD polymer surfaces 107
 cyclic olefin copolymers (COC) 45, 245, 256, 415
- d**
 DC non-thermal plasma discharges 38
 DC pulsed discharges 38
 DEAAm 114, 126
 density functional theory 93
 desorption method 352–353
 dextran 266, 267, 321, 329, 330, 338, 390
 diacyl peroxides (di-benzoylperoxide $[\text{C}_6\text{H}_4\text{C}(=\text{O})-\text{O}]_2$) 241

- 1,4-diaminobutane 216
 1,12-diaminododecane 216
 diarylcarbenes 261, 262
 diazonium-induced grafting 387
 diazonium-modified biaxially oriented
 PET (BOPET) sheets 257, 258,
 284
 diazonium modified-multiwalled
 carbon nanotubes (CNTs)
 303
 diazonium salt 241, 250–261, 279, 284,
 387, 388
 di-cumylperoxide [C₆H₄—C
 (CH₃)₂—O]₂ 241
 dielectric barrier discharges (DBD)
 39–40, 70, 79, 350
 diene polymer 166
 diethylaminosulfurtrifluoride (DAST,
 Et₂NSF₃) 221
 diffusion coefficient 147–149
 diffusion theory 44
 difluorotriazine 226
N,N-dimethylaminoethylmethacrylate
 (DMAEMA) 248
 2-(*N,N*-dimethylaminoethyl)
 methacrylate (DMAEMA) 172,
 196
 dip method 384
 disulfide bond 327
 di-*t*-butylperoxide *t*-Bu—O—O—*t*-Bu
 241
 dithiol AIBN derivative 275
 divinyl benzene (DVB) 120, 123
 DMAAm 114, 126
 DMEAMA 115, 126
 DNA nanobiosensors 405
 dyeability of textile materials 47
 dynamic light scattering (DLS) 337,
 338
 Dyneon THV™ 259
- e**
 effective diffusion coefficient 148, 149
 EGDA and EGDMA 124
 electrically conductive coatings 144
 electron avalanche 35, 36
 electron density 33, 34, 41, 78, 81, 86,
 113, 352
 electrons energy distribution function
 (EEDF) 40, 70, 71, 86, 88, 95
 electron temperature 33–35, 70
 electrospun biosourced polymers 277
 electrospun PCL scaffolds 54
 electrospun silk fibroin (SF) nanofibers
 55
 electrostatic theory 44
 energy-deficient domain 78
 enthalpy of sorption (ΔH_s) 145–147,
 149
 enzyme-coated PE film 167
 enzyme-linked immunosorbent assays
 (ELISAs) 415
 equilibrium discharges 34, 35
 equilibrium plasma 34
 estradiol 334, 335
 etched-sputtered Teflon 7
 ethylene glycol diacrylate (EGDA) 115,
 201
 ethyleneglycol dimethacrylate
 (EGDMA) 115, 119, 120, 124,
 201
ex situ surface modification 127
- f**
 floating potential 71–72, 88
 fluorocarbon polymer 5
 fluoropolymers 107, 119, 188, 229, 259
 fluoro polymers 259–260
 fluoropolymers 403
 Fmoc/Boc/Alloc solid-phase approach
 338
 Fourier transform IR (FTIR)
 spectroscopy 341–342
 frictional force 174
 friction coefficient 172–174
 fully-dense inorganic substrates 135
 functionalized PPF 69, 76, 83, 87
 functional polyperoxide (FPP) 243,
 244
 functional, surface reactive, and
 responsive organic films
 113–127

g

galactose/galactose-mimics 334
 gamma radiation 350
 gamma ray-induced modifications
 grafting modifications 186–197
 gas molecules 5
 gastric epithelial cell membrane-coated PLGA nanoparticles 328, 330
 gelatin 53, 166, 262, 321, 322
 glass transition temperature 13, 15, 16, 18, 49, 113, 220, 408
 gliding arc 41
 glow discharges 35, 38, 40, 44, 68, 88, 232, 366
 glycerol 188, 195, 196, 390
 GO membrane 376, 377
 grafted hydrophilic
 poly((polyethyleneglycol) methacrylate) 389
 grafted plasma pre-treated polymers 402
 grafted polymers 2, 57, 187, 232, 276, 285, 354, 389, 390
 grafting initiated by
 chemical/electrochemical means 385–389
 grafting methods
 controlled grafting-from 389–392
 “grafting-to” approach 378–381
 methods 381–389
 grafting modifications
 applications 194–197
 ionic grafting 192–193
 limitations 187
 natural polymers 187
 propagation mechanism 187
 radiation-induced grafting methods 188–192
 RAFT 193
 grafting, plasma 56–59
 “grafting-to” approach 378–381
 graft polymerization 163, 168–180, 187, 188, 244, 276, 381–382, 387, 393
 graphene oxide (GO) nanosheets 376

h

hammering effect 205
 heavy ion-induced modifications 202–205
 high density polyethylene (HDPE) 243, 403
 high energy irradiations 368, 369, 385
 high-energy irradiation sources 385
 high-flux superhydrophobic membranes 375–376
 High Internal Phase Emulsion (HIPE) 216
 highly crosslinked organic networks 107
 highly cross-linked PPF 68
 highly hydroxylated CNCs 219
 high purity CVD polymers 107
 Hildebrand and Hansen solubility parameters 6
 Hildebrand solvent parameter 6
 homopolymer(s) 108, 110, 113, 116, 119, 120, 123, 124, 130, 188–191, 242, 412
 homopolymer formation 189–191
 hybrid photovoltaic cells 154–155
 hydrazone bonds 327
 hydrogen passivated silicon 128
 hydrogen peroxide 244–246
 hydrolysis
 PET 216
 PMMA 216–217
 poly(ϵ -caprolactone) (PCL) 215
 polylactic acid 213
 hydrophilic nanofiltration membranes 224, 384
 hydrophilic polymer-grafted UHMWPE 172
 hydrophilic polymer surfaces 15
 hydrophilic/water-soluble polymers 169
 hydrophobic iCVD P(PFDA-co-DVB) 120
 hydrophobic polymers 250, 323, 348, 353, 364
 hydrophobic recovery of
 plasma-modified polymers 59

- 4-hydroxybenzoic acid 249
 2-hydroxyethyl methacrylate (HEMA)
 195, 279, 387, 388
 hydroxylated polyethylenes 243
- i**
- iCVD PDVB homopolymers 123
 iCVD PPFM reactive layer 126
 iCVD PV3D3 122, 124
 imidazole 247
 immersion method 384
 immiscible polymer blends 4, 6, 8
 induced plasma polymerization 74
 inductive coupled plasma (ICP) 351
 inert synthetic polymers 50–53
 infiltrated precursors (penetrants) 148
 infiltration 135–138
 iniferter (initiator-transfer-terminator)
 284
 initiated chemical vapor deposition
 (iCVD) 370
 adhesion and grafting 127–128
 dewetting effects 108
 functional, surface reactive, and
 responsive organic films
 113–127
 mechanistic principles of 108–113
 reactors for organic films 128–129
 initiators 109
 inorganic polymeric substrates
 305–306
 inorganic salts 178–180
in situ graft co-polymerization 224
in situ polymerization stringed assembly
 (SPSA) 281
in situ surface modification 127
 insulating vinyl and other monomers
 polydopamine (PDA) bioinspired
 adhesive 284
 simultaneous photoinduced electron
 transfer and free radical
 polymerization 282–284
 surface-initiated photoiniferter 284
 type I and type II photoinitiation
 systems 275–282
 interdigitated gold electrode-coated
 flexible PET sheet 294
 interdigitated PPy humidity sensors
 294
 interfacial adhesion of polymers
 353–354
 ion-activated growth model (AGM)
 74
 ion energy distribution function (IEDF)
 88, 94, 95
 ion hammering effect 205
 ionic grafting 192–193
 ionic surfactants 5
 ion imprinted clay-polymer
 nanocomposite 279
 ionizing radiation sources 186
 irradiation-based direct polymer
 modification
 high energy irradiations 368–369
 plasma treatment 365–366
 UV irradiation 366–368
- j**
- jute fibers 234
 jute yarns 243, 245, 246
- k**
- 175 kDa C-type lectin receptor 334
 Kevlar[®] 266
 kinetic gas theory 70
 kinetics of precursor diffusion
 147–148
- l**
- Lab-on-a-Foil 415
 Lab-on-Chip microdevices 415
 Large Hadron Collider 186
 laser-induced periodic surface
 structures (LIPSS) 416
 laser modification
 interaction with cells 411–412
 sensor construction 412–416
 laser nanopatterning 414
 lauryl peroxide [C₁₂H₂₅—(C=O)—O]₂
 241
 LbL modified membranes 375
 light responsive iCVD layers 125
 linear accelerators 186
 linear energy transfer (LET) 203

- linear low density polyethylene (LLDPE) 243
- line intensity ratio 86
- linker-free grafted crosslinked PDVB layers 128
- linker-free grafting 127
- lipids 119, 329–332
- living free-radical polymerization 193
- local electrostatic potential 33
- local thermodynamic equilibrium (LTE) conditions 33
- low density polyethylene (LDPE) 45, 49, 243, 247, 403, 410
- low molar mass polymer 4, 7, 16
- low pressure plasma polymerization (LP-PP) 69, 79, 81, 83, 84, 94, 995
- low temperature plasma techniques 365
- m**
- macroporous flow-through membrane adsorbers 391
- manganese
meso-tetra-2,6-dichlorophenylporphyrin acetate
Mn(TDCPP)OAc 247
- mass spectrometry (MS) 69, 84, 87–96, 147
- mass transfer changes 49–50
- MATLAB[®] software program 79
- Maxwell-Boltzmann distribution 33, 70
- mechanical interlocking theory 44
- mechanical polymer surface modification 354
- mechanical properties 4, 18, 76, 113, 150, 174, 198–200, 206, 213, 220, 242, 256, 353, 366, 400, 402, 406, 407, 414
- membrane coating
from gas phase 369–371
from wet phase 371–378
- membrane modification 258, 364, 379, 392
- mercury lamps 164, 165
- metal-organic ALD precursors 140
- metal-organic frameworks (MOFs) 142, 364, 376
- metal-organic precursor molecules 135
- metal oxide ALD 140, 142, 144
- (meth)acrylate/styrene monomers 389
- methacrylic acid (MAAc) 110, 114, 167, 195, 216, 335, 386
- 2-(methacryloyl)ethyl phosphoric acid (MPA) 172
- 2-methacryloyloxy-benzoic acid 195
- 2-methacryloyloxyethyl phosphorylcholine (MPC) 171–172
- methyl 3-mercaptopropionate (MMP) 10
- miscible polymer blends 8
- molecularly imprinted polymer (MIP) 284, 285
- molecular recognition ability 273
- momentum density 83
- monoclonal antibodies (mAb) 333
- monolith 216
- monomer(s) 109, 116
- monomer-deficient regime 79
- multiple pulse infiltration (MPI) 138
- multivinyl monomers 124
- mussel-inspired polydopamine (PDA) coatings 372
- MWCNT-polystyrene (MWCNT-PS) nanocomposites 275
- n**
- N*-acetylgalactosamine (NAcGal) 334
- Nafion 10
- Nafion 115 membranes 375
- nano- or micro-patterned material surfaces 399
- nanoparticles
albumin 320
alginate 320–322
chitosan 321
covalent conjugation 325–326
drug delivery applications 328–336
dynamic light scattering 337
fabricated using preformed polymer 323

- nanoparticles (*contd.*)
- Fourier transform IR (FTIR)
 - spectroscopy 341–342
 - gelatin 322
 - non-covalent interactions 328
 - particle size 336
 - PLA 322–323
 - PLGA 322–323
 - poly- ϵ -caprolactone 323
 - polymers used in preparation of 320
 - scanning electron microscopy
 - 337–339
 - in situ* preparation of 323
 - surface charge 339–340
 - surface hydrophobicity 340–341
 - transmission electron microscopy
 - 339
- nanostructure 46, 69, 138, 153, 289, 290, 305, 307, 405, 410
- native nylon 6 capillary-channeled polymer fibers 247
- natural biodegradable polymers 55–56
- natural polymers 187, 199, 234, 243, 260, 289, 291, 320, 321, 356
- $[\text{Ni}(\text{Me}_4\text{Phen})_3](\text{BPh}_4)_2$ 243
- (*N*-isopropylacrylamide) (NIPAAm) 114, 126, 190, 195
- nitrenes 241–268
- N*-methyl-2-benzoyl- β -naphthiazoline 166
- N,N*-dimethylamino-functionalized diazonium cation 279
- N,N*-dimethylamino-functionalized thiol 279
- N,N*-dimethyl aminosilane 279
- N,N'*-methylene bis(acrylamide) (BIS) 337
- N,N'*-methylene-bis-acrylamide 243, 337
- N,N,N',N'*-tetramethylene ethylenediamine 337
- noncovalent surface modification 234–235
- nondegradable polymers 403
- non-equilibrium plasmas 34, 35, 70
- non-imprinted polymer-coated beads (NIP) 284
- non-intrinsically photoactive polymers 383
- non-polymerizable photoinduced surface reactions 166
- non-thermal equilibrium 70
- non-thermal plasma 34–38, 41–43, 47, 53, 54, 59–61, 67, 359
- non-thermal plasma for polymer surface treatment 41–43
- Norish type II photoinitiator 281
- Norrish initiators 275
- N*-vinylcaprolactam (NVCL) 114, 191, 195, 196
- N*-vinylimidazole (NVIm) 191, 196
- nylon 123, 136, 202, 247, 305, 403, 415
- O**
- oligomeric ions 93, 94
- oligo(ethylene glycol)
 - monomethacrylate (OEGMA) 172
- oligosaccharide-lectin interactions 334
- optical emission spectroscopy (OES) 69, 84–87
- optical properties 18, 204, 410
- optical sensing strategies 414
- organic films 108, 113–128
- organic-inorganic BCPs 153
- organic membranes 364
- organosilicon and organosilazanes 121
- oxidizing plasmas 141
- oxygen 248–249
- ozonation 231–233, 244
- ozone 39, 165, 231–233, 244, 354, 387
- ozone-induced grafting 387
- P**
- P(4VP-*co*-EGDA) 124
- palladium-doped polypyrrole 306
- particle-decorated PET fibers 282
- patterning for microsystems 153
- PCL nanofibers 54
- PEK-COOH ultrafiltration membranes 224
- penetrant diffusion and reaction 148–149
- peptides 333–336

- peptide-decorated silk fibroin coatings 223
- perfluoroalkyl functional groups 119
- perfluorosulfonated ionomers 10
- peroxides 241–244
- persulfates 241, 243, 246–248, 303, 337, 385, 386
- PET
- aminolysis 216
 - chemical oxidation 234
 - chemical reduction 225–227
 - hydrolysis 216
- phenylazides 167, 171, 264, 266
- phenyldiazirine 167
- photochemically prepared PANI (polyaniline) thin films 295, 298
- photochemical surface modifications 163, 164
- photoinduced chemical reaction between polymers 166–167
- photoinduced grafting at the polymer surface 168–169
- photoinduced graft polymerization
- artificial organs 172–174
 - high-functionality materials 169–172
 - inorganic salts 178–180
 - poly (aryl ether ketone) 174–178
- photoinduced reactions on polymer substrates 165
- photoinduced self-initiated polymerization 175, 176
- photo-*iniferter* 284, 285
- photoinitiated graft polymerization 168, 172
- photoirradiation energy 164
- photopolymerized poly(ethylene glycol diacrylate) (PEGDA) 294
- photo-reactive benzopinacol 391
- photoreactive polymers 167, 367
- photosensitizers 125, 166, 168, 170, 180, 255, 257, 281, 287–291, 294, 297, 298
- pH responsive iCVD films 126
- physical crosslinking 198
- physical vapor deposition (PVD) 369
- physicochemical polymer surface modification 349
- piezopolymer blend 254
- pinhole-free iCVD homopolymer layers 124
- Planck's constant 84, 164
- plasma 70
- adhesion improvement 43–47
 - atmospheric pressure plasma jet 40–41
 - biomedical applications 50–56
 - DC non-thermal plasma discharges 38
 - DC pulsed discharges 38
 - definition 33–34
 - dielectric barrier discharge 39–40
 - formation of non-thermal plasma 35–37
 - gliding arc 41
 - grafting 56–59
 - hydrophobic recovery 59–60
 - methods of plasma generation 37–41
 - packaging & textile applications 47
 - RF and MW discharges 38–39
 - thermal vs. non-thermal 34–35
- plasma ablation/etching 42
- plasma activation 42–43
- plasma assisted ALD 142
- plasma enhanced CVD (PECVD) 113, 123, 356
- plasma functionalization 42–43
- plasma-induced graft polymerization 381–382
- plasma passivation 42, 43
- plasma polymer films (PPF)
- biotechnology 69
 - cross-linking density 67
 - mass spectrometry 87–96
 - optical emission spectroscopy 84–87
- physico-chemical properties 68
- plasma polymerization 69–83
- precursor 67
- synthesis 69

- plasma polymerization
 - fundamentals 70–72
 - growth mechanism 72–83
- plasma polymerized polyethylene glycol (PEG) 81
- plasma polymerized propylisobutyrate (PiB) 81
- plasma-polymerized styrene film 68
- plasma polymer nanoparticles 73
- plasma-state polymerization 74
- plasma-treated CS/PEO nanofibers 55
- plasma treatment 365–366, 400–411
- plasticization 5, 16
- plastic wastes 213, 273
- PMMA
 - aminolysis 216–217
 - chemical oxidation 233
 - chemical reduction 227
 - hydrolysis 216–217
- poly((2-dimethylamino)ethyl methacrylate-*co*-butyl methacrylate) (poly(DMAEMA-*co*-BMA)) 385, 386
- poly(2-hydroxyethyl methacrylate) (PHEMA) 279
- poly(3-hexylthiophene-2,*S*-diyl) (P3HT) 141
- poly(3-hydroxybutyrate-*co*-3-hydroxyvalerate) (PHBV) 358, 359
- poly(3-sulfopropyl methacrylate) (PSPMA) 285, 287
- poly(4-styrenesulfonate) (PEDOT : PSS) 305
- poly(4-vinylpyridine) 195, 379
- poly(acrylamide-*co*-bisacrylamide) 284
- poly(aryl ether ketone) (PAEK) 174–178
- poly(dimethylsiloxane) 250
- poly(ϵ -caprolactone) (PCL) 213
 - aminolysis 215–216
 - hydrolysis 215–216
- poly(ether ether ketone) (PEEK) 5, 45, 174
- poly(ether sulfone) (PES) 364
- poly(ethylene terephthalate) (PET) 18, 351
- poly(glycolic acid) (PGA) 213, 214, 356
- poly(lactic-*co*-glycolic acid) (PLGA) 214, 322–323, 356
- poly(methyl methacrylate) 10, 144, 287, 302
- poly(*n*-butyl acrylate) 302, 321
- poly(*N*-isopropylacrylamide) (PNIPAAm) 190, 254, 264
- poly(*N*-vinylpyrrolidone) 166
- poly(oligo(ethylene glycol) methyl ether methacrylate) (OEGMA) 287
- poly(pentafluorophenyl methacrylate) (PFMA) 287
- poly(vinyl alcohol) (PVA) 140–141, 321, 371
- poly(vinylidene difluoride) (PVDF) 45, 58, 112, 230, 254, 331, 364, 370, 373, 379, 380, 382
- poly(vinylidene fluoride-*co*-trifluoroethylene) 390
- polyacrylamide (poly(AAm)) 166
- polyacrylic acid (PAA) 227, 235, 257, 258, 284
- polyacrylic acid-*co*-maleic acid (PAA-*co*-PMA) 257
- polyacrylonitrile (PAN) ultrafiltration (UF) membranes 365
- 6,6-polyamide 242
- polyamide (PA) 49, 58, 166, 202, 242, 264–266, 364, 403
- polyaniline 251–252
 - mechanisms of photopolymerization 294–297
 - substrates for in situ photo-induced polymerization 298
- polyaramide fibers 144
- polyaryletheretherketone (PEEK), chemical reduction 220–224
- polybutadiene modified epoxy (PBME) 10
- polybutylene succinate (PBS) 340, 353, 356, 358, 359
- polybutylene terephthalate (PBT) 202
- polycaprolactone (PCL) 350, 353, 356

- polycarbonate compact discs (CD) 229
- polycarbonates (PC) 45, 126, 166, 227–229, 382, 415
- polycationic chitosan polymer 234
- polydimethylsiloxane (PDMS) 141
- polydopamine (PDA) 328
 bioinspired adhesive 284
- poly-*c*-caprolactone (PCL) 323
- polyester fabric 47
- polyetheretherketone (PEEK) 256–257, 403
- polyethersulfone membranes 277
- polyethersulfone (PES) membranes 258, 277
- polyethylene (PE) 165, 202, 243
 chemical oxidation 231–233
 food industry 356
- polyethylene glycol (PEG) 81, 82, 114, 244, 265, 321, 323, 334–336
- polyethyleneimine (PEI) 235, 258, 338
- polyethylene naphthalate (PEN) 402, 414
- polyethylene terephthalate (PET) 45, 165, 255, 257–258, 282, 402, 414
 fibers 282
 film 165
 food industry 356
- polyglycidal methacrylate (PGMA) 113, 118, 119
- polyglycolic acid (PGA) 356
- poly(MPC)-grafted PEEK 176–179
- poly(MPC)-grafted-UHMWPE 173, 174
- polyhydroxyalkanoates (PHA) 58, 356, 411
- polyhydroxyethylacrylate (PHEMA) 120
- polyhydroxybutyrate (PHB) 411
- polyimide 45, 144, 154, 402
- polyimide films 154
- polylactic acid (PLA) 350, 356
 aminolysis 213–214
 films 60
 hydrolysis 213–214
- polylactic-co-glycolic acid (PLGA) 350
- polylactide PLA 321–323
- poly(MPC) layer 173, 175, 178–180
- poly-L-lactic acid thin films 408
- polymer(s) 204
 biological modification 354–355
 blends 4, 6–8, 152
 brushes 6, 7, 169, 276, 289
 chemistry 3–4, 13, 15–17, 21, 68, 139, 151, 152
 food packaging 355–358
 gas phase 349–350
 grafting and polymerization 354
 interfacial adhesion 353–354
 liquid and bulk phase methods 352
 mechanical methods 354
 patterning 402
 radiation 350–352
- polymer-ceramic and polymer-metal systems 46
- polymer chains 2, 3, 6, 8, 10, 11, 14–18, 43, 60, 110, 123, 127, 141, 142, 165, 169–172, 177, 179, 180, 193, 199, 201, 214, 266, 282, 366, 378, 381, 383, 389, 393, 401, 402
- polymeric foils 416
- polymeric micelles 195
- “polymer-like” films 113
- polymer/metal interfaces 10
- polymer-polymer interactions 6
- polymer-polymer TENGs 156
- polymer substrates selective adsorbents 273
- polymer surfaces
 application-related modification 1
 charged molecules 5
 definition 2
 experimental methods 21
 Flory-Huggins theory 7, 8
 gas molecules 5
 glass transition temperature 15–16
 guiding force 1
 immiscible polymer blends 8
 large composition fluctuation 7
 long-range chain statistics of polymer molecules 7
 mechanical properties 18
 microscopic level 11–12
 miscible polymer blends 8

- polymer surfaces (*contd.*)
 - optical properties 18
 - polymer chemistry 3–4
 - protein fouling 15
 - similar polymer pairs 8
 - solid surface 8–10
 - solvents 5–7
 - surface crystallization 17
 - surface properties 1
 - surface wettability 13–15
 - treatment 41–43
- poly[3-(methacrylamino)propyl]
 - trimethyl ammonium chloride (PMAPTAC) 294, 296
- polymethylmethacrylate (PMMA) 50, 216–217, 227, 232, 254–255, 403
- poly-4-methyl-1-pentene (PMP) 405
- poly(dimethyl siloxane) (PDMS)
 - microfluidic channels 277
- poly(ethylene glycol) monomethacrylate 171
- poly(acrylic acid) nanobrushes 195
- polyNIPAm 254
- polyolefin 163, 166, 168, 169, 171, 405
- polyolefine substrates 169, 171
- poly(methyl phenyl siloxane)
 - (PMPS)/organophilized silicate 16
- poly(4-vinylbenzyl chloride-co-styrene)
 - particles 284
- poly(D,L-lactide-co-glycolide) PLGA 321–323
- poly(3,4-ethylenedioxythiophene)-poly(styrenesulfonate)
 - (PEDOT : PSS) 253–254, 305
- poly(ethylene 2,6-naphthalate) (PEN)
 - polymers 144
- poly(lactide-co-glycolide) (PLGA)
 - polymers 322, 353, 357
- poly[poly(ethylene glycol) methacrylate] (PPEGMA) monomers 282
- (poly p-phenyleneterephthalamid) 250
- polypropylene (PP) 165, 202, 255
 - chemical oxidation 231–233
 - food industry 356
 - sheet 245
- polypyrrole 251
- photopolymerization mechanism 290
 - substrates for in situ photo-induced polymerization 291–294
- polyquercetin (pQCT) nanoparticles 340
- polysaccharides 199, 216, 217, 266, 320, 321, 329, 330
- poly(methyl methacrylate) (PMMA)/silver (Ag) interface 10
- polystyrene 302, 402
 - chemical oxidation 233
- polystyrene (tissue polystyrene) 402
- polysulfone (PSf) ultrafiltration membranes 365
- poly(ethylene 2,6-naphthalate) surface 247
- polytetrafluoroethylene (PTFE) 285, 371
 - chemical reduction 229, 231
- polyurethane
 - chemical oxidation 233–234
- polyvinyl alcohol (PVA) 136, 140–141, 219, 323, 353
- polyvinylchloride 255
- potable water 363
- PP/modified rubber powder composite 243
- p(HEMA-co-PEGMA500) polymer 263
- PPyAg-coated PET sheets 293
- PPyAg/PPyAu binary nanocomposites 291
- precursor-polymer couple 136
- pre-irradiation method 189–190
- pre-irradiation oxidative method 190–191, 193, 194
- pro-drug polymers 195
- 1,3 propane sultone (PS) 124
- propanethiol PPF 83
- protein fouling 15
- protein microchips or microarrays 415
- protonated poly(allylamine)/poly(4-styrenesulfonate)
 - multilayer films 375
- pseudo-ALD coatings 141

- P4VP (pH-sensitive polymer) 195
 pyrrolyl-functionalized silane 292
- q**
 quadrupole analyzer 88
 Quartz Crystal Microbalance (QCM)
 19, 149, 262
- r**
 radiation-induced grafting methods
 and methods 191–192
 pre-irradiation method 189–190
 pre-irradiation oxidative method
 190
 simultaneous/direct method
 190–191
 radical initiators
 alkyl halides 260
 azo compounds 249–250
 diazonium salt 250
 hydrogen peroxide 244–246
 oxygen 248–249
 peroxides 241–244
 persulfates 246–248
 random copolymers 16, 108, 120, 248
 rapid step growth polymerization
 (RSGP) 72, 73
 reaction enthalpy (ΔH_{rxn}) 145
 redox-initiated membrane grafting
 385
 reverse osmosis membranes 124, 127,
 265, 266, 363, 371–373, 375, 387
 Reversible Addition-Fragmentation
 chain Transfer (RAFT) 188,
 193, 302, 389
 RF and MW discharges 38–39
 rod-like macromolecules 12
 ruthenium dye $[\text{Ru}(\text{bpy})_3]\text{Cl}_2$ 257
- s**
 salts 5, 178–180
 scanning electron microscopy (SEM)
 20, 152, 337–339, 357, 404, 413
 scavenger effect 74
 secondary electron avalanches 35, 36
 secondary electron multiplier (SEM)
 detector 88
 Seebeck coefficient 293
 segmental relaxation (α -relaxation)
 process 16
 self-assembled BCPs 153, 154
 self-initiated photografting and
 photopolymerization (SIPGP)
 protocol 287
 self-initiated photoinduced graft
 polymerization 174–180
 self-organized block co-polymers
 (BCPs) 153
 semibenzopinacol radical 174
 sequential infiltration synthesis (SIS)
 138
 sequential vapor infiltration (SVI) 138
 sheath 72, 75, 76, 94, 95
 “side crystalline” chains 3
 silica nanoparticles 12
 silicone rubber 187, 195, 196
 similar polymer pairs 8
 simultaneous photoinduced electron
 transfer and free radical
 polymerization 282–284
 small fraction 2
 small molecule ligands 329, 333–335
 smart materials 4, 399
 “smart” materials 4, 399
 sodium dodecyl sulfate (SDS) 353
 sodium lauryl sulfate (SLS) 353
 sodium styrene sulfonate (SSS) 189
 solid surface 7, 8, 17, 18, 174, 415
 solubility coefficient 146
 solvation phenomenon 6
 solvent(s) 5
 solvent-polymer interaction 6
 solvent-solvent interaction 6
 sono-induced polymerization 302
 sonoluminescence 301
 sonopolymerization 273, 274, 303,
 305–306
 sputtered Teflon 7
 stable hydrocarbon based molecules
 90
 sticking probability 75, 112
 streamer discharges 35
 streptavidin 328, 331, 416
 styrenic monomers 122

- SU-8 151
 - substrate-C(Phenyl)₂-OH 277
 - sulfonated polystyrene 166
 - surface charge 328, 336, 339–340, 364, 387, 401
 - surface-confined photopolymerisation
 - polyaniline 294–298
 - polypyrrole 290–294
 - surface-confined radical
 - photopolymerisation
 - polydopamine (PDA) bioinspired adhesive 284–287
 - recent trends 287–289
 - simultaneous photoinduced electron transfer and free radical polymerization 282–284
 - surface-initiated photoiniferter 284
 - type I and type II photoinitiation systems 275–282
 - surface-confined sonochemical polymerization
 - inorganic polymeric substrates 305–306
 - origin of the phenomenon and mechanism of polymer synthesis 298–303
 - sonopolymerization 303
 - ultrasonic spray 303–305
 - surface crystallization 17
 - surface free energies 4, 5, 7, 13, 42, 43, 50–52, 59
 - surface functionalization 141, 189, 191, 206, 241, 242, 276, 340, 342, 347, 352, 380, 383
 - surface hydrophobicity 188, 339–341, 365, 385
 - surface-initiated ATRP (SI-ATRP) 171
 - surface-initiated photoiniferter 284
 - surface modification of polymers
 - carbenes 261–264
 - nitrenes 264–267
 - surface modification technology 163
 - surface properties of polymeric materials by photoirradiation 165–166
 - surface tension 2, 13, 54, 108, 112, 156, 352, 356
 - surface treated polyesters 402
 - surface wettability 12–15, 52, 55, 214, 358
 - surfactants 5, 291, 323, 324, 352, 353
 - swift heavy ions (SHI) 202
 - irradiation 186
 - synchrotrons 186
 - synthetic biodegradable polymers 54–55
 - synthetic polymers 54, 55, 163, 169, 187, 188, 275, 276, 320, 347, 356–358, 406
- t**
- taurine 214, 215
 - technical poly(ether ether ketone) 5
 - Teflon™ 229
 - Teflon FEP 7
 - tertiary amines 114, 115, 124–126, 170, 378, 385
 - tetrameric glycoprotein avidin 328
 - thermal equilibrium 70
 - thermal plasma 34, 40, 324, 351
 - thermal responsive hydrogels 126
 - thermal vs. non-thermal plasma 34–35
 - thermoplastic elastomers (TPE) 202
 - thermoplastic polyurethane membrane 244
 - thermo-sensitive polymer 195, 254
 - thin film nanocomposite (TFN) membranes 376
 - thin film transistors (TFTs) 122, 124
 - thin poly(styrene)-*b*-poly(ethylene oxide) films 6
 - thio-ether bond 326, 331
 - thiol-ene systems 170
 - 3D-carbene surface 262
 - TiO₂/PPyAg hybrid composite thin layer 294
 - transmission electron microscopy (TEM) 20, 136, 152, 336, 339, 372
 - triallyl isocyanurate (TAIC) 201
 - triazole ring formation 326
 - triboelectric nanogenerators (TENGs) 155, 156
 - trifluorotriazine 226
 - tritiated lysine 226
 - two-dimensional ZIF-8/GO hybrid nanosheets 376

- type I and type II photoinitiation systems 275–282
- type II surface-confined photopolymerization initiation 279
- U**
- ultra-high molecular weight PE (UHMWPE) 52, 53, 58, 172–174, 180, 231, 403
- ultrasonic spray 301, 303–305
- ultrasound-assisted polymerization 302–305
- ultrathin PEGDMA layers 124
- ultrathin polystyrene (PS) 402
- ultrathin (6 nm) PV3D3 layers 122
- unreactive polymer substrates 141–143
- unstretched PET film 165, 166
- untreated SF nanofiber matrices 55
- UV-induced grafting 383–384
- UV irradiation 224, 230, 231, 247, 256, 276, 366–368, 380, 383, 384, 391
- V**
- Van de Graaff, cyclotrons 186, 202
- Van't Hoff equation 149
- Van't Hoff relationship 146
- vapor barriers 135, 144, 154, 347
- vapor diffusion barriers 154
- vapor phase infiltration (VPI)
 - altering mechanical performance 150–151
 - application spaces 155–156
 - vs. atomic layer deposition (ALD) 135–138
 - conducting polymers and hybrid photovoltaic cells 154–155
 - contrasting agent for imaging block co-polymer 152
 - fundamental steps 145
 - improved chemical resistance 152–153
 - kinetics of precursor diffusion 147–148
 - molecular precursor thermodynamics 145
 - patterning for microsystems 153
 - thermodynamics and kinetics 149–150
 - vapor diffusion barriers 154
 - vapor phase molecular precursor 145
 - vapor phase precursor solubilizing 145
 - vertically aligned core/shell-like polyaniline-wrapped ZnO nanorod composite films 257
 - vinyl ether 166
 - viscoelastic UHMWPE substrate 174
 - vulcanization 197, 198
- W**
- waste tire powder recycling 242
- water contact angle (WCA) 51, 53, 60, 120, 173, 214, 216, 217, 225, 226, 230–234, 242–245, 247, 249, 253–255, 260, 265, 285, 347, 365, 371, 410
- water vapor plasmas 141, 365
- water vapour transfer rates (WVTRs) 154
- wettability 347
- wetting properties 243, 273, 389, 393
- Y**
- Yasuda parameter 78, 79
- Z**
- zero “native” surface potential 5
- ZIF-8/GO hybrid nanosheets 376, 377
- ZIF-8/GO hybrid nanosheets functionalized TFN membranes (TFN-ZG) 376
- ZIF-8 hybrid nanocomposites 376
- ZnO nanoparticles 154, 306
- ZnO nanorod/polyaniline composite film 257
- zwitterionic [3-(methacryloylamino)propyl]dimethyl(3-sulfopropyl) ammonium hydroxide 248
- zwitterionic-modified surfaces 124
- zwitterionic polymer capsuled protein based nanogel 337
- zwitterionic polysulfobetaine hydrogel 248

