

Index

π^* -resonances 146

a

absorption-fluorescence spectra 163
 accelerated plasma aging of polymers 22
 – energies of aging reactions 244
 – hydrogen plasma exposure 244–247
 – noble gas plasmas (CASING) 247
 – polymer response to long-term plasma exposure 239–244
 acetylene 354
 acrylic acid 404, 416–421
 – copolymers
 – styrene 443–445
 acrylonitrile 404, 421, 422
 activation of C–H bonds by functionalization 14
 adsorption layer polymerization 345, 346
 aerosol-DBD 312–319
 – compared with electrospray 329
 – schematic diagram 324
 aging of polymers
 – accelerated plasma aging of polymers 22
 – pulsed plasma polymerization 401, 402
 aliphatic polyolefins 55
 aliphatic self-assembled monolayers
 – surface oxidation
 – kinetics 73–75
 allyl alcohol 403–413
 – copolymers with ethylene, butadiene and acetylene 427–434
 – copolymers with styrene 434–443
 – molar mass distributions 437–443
 allylamine 404, 413–416, 445–447
 allyl bromide 404
 aluminium
 – PTFE metallization 221
 ambipolar diffusion 44
 amination of graphitic surfaces 289–292

– grafting onto brominated surfaces 288, 289
 amination of polymer surfaces by plasmas
 – kinetics
 – ammonia plasma treatment 103–109
 – ATR-FTIR 115, 117
 – CHN analysis 117, 118
 – instability caused by post-plasma oxidation 110
 – NMR 118, 119
 – self-assembled monolayers (SAMs) 111, 112
 – side reactions 109, 110
 – ToF-SIMS investigations 114, 115
 – XPS elemental composition measurement 112–114
 – polyolefins 120–123
 amino acids 104
 ammonia plasma treatment 103–109
 – amination of graphitic surfaces 289–292
 – polyolefin surface hydrogenation and amination 120–123
 – self-assembled monolayers (SAMs) 111, 112
 amorphous structure 175
 anisotropic polymers 18
 anisotropy 145
 aromatic ring cracking 23
 Arrhenius law 431, 433
 atmospheric pressure chemical ionization (APCI) 324
 atmospheric-pressure glow discharges (APGD) 48, 303, 305
 atmospheric-pressure plasmas 303, 304
 – DBD polyolefin deposition to improve metal–polymer adhesion 320, 321
 – dielectric barrier discharge (DBD) treatment 304–311

- electrospray ionization (ESI) technique 321–327
- compared with aerosol-DBD 329, 330
- topography 330–333
- with plasma 327, 328
- without plasma 328, 329
- polymerization using DBD 311, 312
- thin polymer film deposition 312–320
- atomic force microscopy (AFM) 309, 319
- topography of PMMA deposition by ESI 330–333
- atomic polymerization 353, 354
- atomic transfer radical polymerization (ATRP) 217, 272
- attenuated total reflectance–Fourier transform infrared (ATR-FTIR) spectroscopy
- amination of polymer surfaces 115, 117
- auto-oxidation 17, 20, 57

- b**
- barrel reactors 47
- benzene 369
- biaxially orientated polypropylene (BOPP) 305
- binding energies 31
 - carbon-containing groups 187
- Boltzmann distribution 37
- bond energies 13
- bremsstrahlung radiation 42
- bromination 63
 - graphitic surfaces
 - alternative bromination precursors 287
 - bromine plasma 281–286
 - efficiency 288
 - rate dependence upon plasma parameters 286, 287
 - PET surfaces 280, 281
 - polyolefin surfaces 258–260, 279, 280
 - change of surface functionality 277, 278
 - grafting onto bromine groups 271, 272
 - process history 260
 - theory 260–265
 - using allyl bromide plasma 269–270
 - using bromoform or bromine plasmas 265–269
 - yield density of grafted groups 272–277
 - bromine treatment 30
 - bromoform dissociation 261
 - butadiene
 - copolymers with allyl alcohol 428, 429

- c**
- C radicals 15
- carbon dioxide plasmas 123–126
- carbon nanostructures (CNSs) 282, 283
- carbon nanotubes (CNTs) 283
- catalysts, plasma 367, 368
- C–C bonds
 - binding energy 13
 - disproportionation 16
 - double bond formation 16
 - scission 16
- C–H bonds
 - binding energy 13
 - functional groups attachment 16
 - H-abstraction 16
 - peroxy formation 16
- cellulose 158
- chain propagation 352
- chain scissions 15
- chain-extended structure 175
- chain-folded structure 175
- charged residue model (CRM) 325
- chemiluminescence 164
- chlorination 63
 - kinetics 134–136
- chromium
 - PET metallization 222, 223
 - PS metallization 223
- coating surfaces with functional group-bearing plasma-polymers 26
 - plasma-chemical polymerization 26
 - pulsed-plasma polymerization 27, 28
- collision rate 43
- contaminants on polymer surfaces 199, 200–202
- copolymerization, pulsed-plasma induced 27, 28
 - acrylic acid and styrene 443–445
 - allyl alcohol copolymers with ethylene, butadiene and acetylene 427–434
 - allyl alcohol copolymers with styrene 434–443
 - allyl amine 445–447
 - kinetics 427
 - rationale 424–427
- copolymerization in continuous-wave plasma mode 368–370
- copolymerization parameters 426
- corona discharges 48, 305
- Coulomb explosion 325
- Coulomb interactions 38
- Coulomb potential 38
- cracking of aromatic rings 23
- crosslinking 17, 20, 29, 185

crosslinking by activated species of inert gases (CASING) 48, 198
 – accelerated polymer aging 247
 crystallinity of polymers 172, 173
 current density 43
 cyclohexane 369
 cyclopentane 369

d

dark reactions 384, 385
 DC low-pressure positive column 44
 Debye length 38
 degradation of polymers 14, 17
 – oxygen plasmas 181–185
 – – PET 182, 183
 degree of ionization of plasmas 37
 dehydrogenation 23
 depolymerization 184
 derivatization of functional groups 185–194
 diaminocyclohexane (DACH) 382
 diborane process 253
 dielectric barrier discharges (DBD) 48, 205,
 206, 304–311
 – improving metal–polymer adhesion 320,
 321
 – polymerization 311, 312
 – thin polymer film deposition 312–320
 dielectric relaxation spectroscopy (DRS)
 364, 400
 diffusion of charge carriers 37, 38
 disproportionation 16
 dissociative ionization 40
 distribution of molar mass 13
 drift velocity 38

e

elastic collisions 43
 electron density 37, 43
 electron excitation 41
 electron temperature 60
 electron velocity 40
 electron-cyclotron radiation (ECR) plasma
 sources 38
 electrospray ionization (ESI) technique 51,
 321–327
 – compared with aerosol-DBD 329, 330
 – schematic diagram 326
 – topography 330–333
 – with plasma 327, 328
 – without plasma 328, 329
 electrospray ionization time-of-flight mass
 spectroscopy (ESI-ToF) 325
 energies of aging reactions 244
 energy level flow diagram 67

equivalence of C–C and C–H bond strengths
 13
 etching 19, 28, 151–155
 ethylbenzene 369
 ethylene
 – copolymers with allyl alcohol 428,
 429
 excimer formation 163

f

field-flow fractionation (FFF) 154
 – degradation of polymers 176, 177
 film forming plasmas 46
 Finemann–Ross kinetics 427
 flexible spacer molecules 215, 216
 floating potential 39, 47
 fluorescence 162, 163
 fluorination 13, 14, 63, 64
 – kinetics 126–134
 – polyolefins 262
 forbidden ground state transitions 41
 fragmentation and random
 polyrecombination 26
 fragmentation–recombination mechanism
 17
 fragmentation–recombination
 polymerization 344, 345
 Franck–Condon principle 162
 fringed micelle structure 175
 functional group attachment 16
 functional groups and interactions with
 other solids 29–31
 functionalization, *see* surface
 functionalization of polymers

g

G-value 65, 66, 338, 352
 gamma-irradiation 24
 gas phase polymerization 345, 346
 gel-permeation chromatography (GPC)
 138, 154, 175
 Gibbs–Helmholtz equation 13, 342
 glass bell-jar reactors 47
 glass transition temperature 419, 420
 glycidyl methacrylate 404
 graft polymerization 447–450
 graft reactions 18
 – pulsed-plasma 450, 451
 graft-poly(ethylene glycol)–poly(vinyl alcohol)
 copolymer (g-PEG-PVA) 313–315
 graphene 282
 graphitic surfaces
 – functionalization 281
 – – amination 289–292

- – amine grafting to brominated surfaces 288, 289
- – bromination efficiency 288
- – bromination rate dependence upon plasma parameters 286, 287
- – bromination with alternative precursors 287
- – bromination with bromine plasma 281–286
- – refunctionalization of brominated surfaces to OH groups 289
- grazing incidence reflectance spectrum 423

- h***
- H-abstraction 16
- helium plasmas 44
- Hess rule 13
- hexamethyldisiloxane (HMDSO) 369
- hexatriacontane 112
- hexyamethyldisiloxane (HMDSO) 312
- high-density polyethylene (HDPE) 149
 - etching rates 152, 153
- highly ordered pyrolytic graphite (HOPG) 284, 285
- highly ordered structures in polymers 173
- hydrogen plasma
 - accelerated polymer aging 244–247
 - hydrogenation of polymer surfaces by plasmas
 - polyolefins 120–123
- hydroperoxide formation 21
- hydrophobic recovery 12
- hydrophobic space molecules 214, 216

- i***
- inelastic collisions 40, 46
- iodination 63
 - polyolefins 262
- ionization, degree of 37, 43, 44
- ionization potentials
 - halogen plasmas 60, 260
 - noble gas plasmas 247
- ionizing radiation 65–67
- ion–molecule reactions 344

- j***
- Jablonski diagram 162

- k***
- Kaplan model 339
- kilohertz plasmas 46, 47
- kinetic chain length 343
- kinetic gas theory 36

- kinetics
 - carbon dioxide plasmas 123–126
 - chlorination 134–136
 - copolymerization 427
 - fluorination 126–133
 - functionalization 69–71
 - – surface oxidation model 71
 - – unspecific functionalization by gaseous plasmas 72
 - polymer surface amination
 - – ammonia plasma treatment 103–109
 - – ATR-FTIR 115–117
 - – CHN analysis 117, 118
 - – instability caused by post-plasma oxidation 110
 - – NMR 118–120
 - – self-assembled monolayers (SAMs) 111, 112
 - – side reactions 109, 110
 - – ToF-SIMS investigations 114, 115
 - – XPS elemental composition measurement 112–114
 - polymer surface oxidation
 - – aliphatic self-assembled monolayers 73–75
 - – categories of changes from oxygen plasma 97–99
 - – poly(ethylene terephthalate) (PET) 86–94
 - – polycarbonate 85–86
 - – polyethylene 75–78
 - – polyolefins 72, 73
 - – polypropylene 78, 79
 - – polystyrene 79–85
 - – role of surface contaminants 100–102
 - – summary of changes 94–96
 - – surface energy 102, 103
 - polyolefin surface hydrogenation and amination 120–123
 - thiol-forming plasmas 125

 - l***
 - Langmuir equation 39
 - Langmuir–Blodgett (LB) monolayers 73, 145, 146
 - ammonia plasma treatment 111, 112
 - lap-shear strength 201
 - Loschmidt constant 197
 - low molecular weight oxidized material (LMWOM)
 - boundary layer 17
 - DBD treatment 306
 - metallization of polymers 204
 - metallization of polymers 205

- low-density polyethylene (LDPE) 149
 – DBD treatment 304
 – etching rates 152, 153
 low-pressure glow discharge types 45–47
 low-pressure plasmas 36, 37
 – energy levels 49
 Lyman irradiation 122
 Lyman series 246
- m**
- macrocycle formation 169–171
 matrix-assisted laser desorption ionization (MALDI) 51
 matrix-assisted laser desorption ionization–time-of-flight (MALDI-ToF) mass spectrometry 175, 176
 Maxwell distribution function 37
 Maxwell–Boltzmann distribution 37
 mean-free path 43, 44
 metallization of plasma-modified polymers
 – background 197, 198
 – improving metal–polymer adhesion using DBD deposition 320, 321
 – inspection of peeled surfaces 228, 229
 – interface redox reactions 220–224
 – lifetime of plasma activation 229–234
 – metal-containing plasma polymers 227, 228
 – metal–polymer interactions with interface–neighbouring polymer interphases 224–227
 – new adhesion concept 213–220
 – plasma-initiated metal deposition 228
 – pretreatment 198, 199
 – homo- and copolymer interlayers to improve adhesion 210–213
 – oxidative plasma pretreatment 202–207
 – reductive plasma pretreatment 207–210
 – surface cleaning by plasma 199–202
 microwave plasmas 47
 molar weight distribution (MWD) of polymers 13, 138, 175, 176
 molecular architecture in polymers 170
 monomers 17
 monosort functional groups 17
 – bromination 258–260
 – process history 260
 – theory 260–265
 – bromination of PET 280, 281
 – bromination of polyolefins 279, 280
 – change of surface functionality 277, 278
 – grafting onto bromine groups 271, 272
 – using allyl bromide plasma 269–270
- – using bromoform or bromine plasmas 265–269
 – yield density of grafted groups 272–277
 – functionalization of graphitic surfaces 281
 – – amination 289–292
 – – amine grafting to brominated surfaces 288, 289
 – – bromination efficiency 288
 – – bromination rate dependence upon plasma parameters 286, 287
 – – bromination with alternative precursors 287
 – – bromination with bromine plasma 281–286
 – – refunctionalization of brominated surfaces to OH groups 289
 – – grafting onto radical sites 294, 295
 – – C-radical sites 295, 296
 – – plasma ashing 297
 – – post-plasma radical quenching 296, 297
 – – radical types 295
 – oxygen plasma exposure and chemical treatment 251–256
 – efficiency in converting O-functional groups to OH groups 255
 – post-plasma chemical grafting
 – – onto COOH groups 258
 – – onto NH₂ groups 257, 258
 – – onto OH groups 256, 257
 – production at polyolefin surfaces 249–251
 – production at polyolefin surfaces: example processes 251
 – SiO_x deposition 292–294
 multi-angle laser light scattering (MALLS) 176, 177
 multiwall carbon nanotubes (MWCNTs) 284, 285
- n**
- natural graphite (NG) 284, 285
 near-edge X-ray absorption fine structure (NEXAFS) spectroscopy 145
 – aliphatic self-assembled monolayers 75
 – octadecyltrichlorosilane (OTS) 150, 151
 – poly(ethylene terephthalate) (PET) 90, 91, 146, 147–150, 151
 – polycarbonate 86, 87
 – polypropylene 79

- polypropylene 151
- polystyrene 82
- nickel
 - plasma enhanced chemically vapor deposition (PECVD) 228
- noble gas plasmas 136–139
- accelerated polymer aging 247
- non-aliphatic polymers 55
- non-isothermal behavior 36
- Norrish rearrangements 18
- N*-oxide formation 110
- nuclear magnetic resonance (NMR) spectrometry: amination of polymer surfaces 118–120

o

- octadecyltrichlorosilane (OTS) 73, 147
- NEXAFS 150, 151
- plasma etch gravimetry 157
- unsaturation formation 166, 167
- olefinic unsaturation 23
- oxidation 13, 14
- oxidation of polymer surfaces by plasmas 48, 49
- fluorination 64
- formation of O-functional groups 55–57
- kinetics
- - aliphatic self-assembled monolayers 73–75
- - carbon dioxide plasmas 123–126
- - categories of changes from oxygen plasma 97–99
- - noble gas plasmas 136–139
- - poly(ethylene terephthalate) (PET) 88–93
- - polycarbonate 85, 86
- - polyethylene 75–78
- - polyolefins 72, 73
- - polypropylene 78, 79
- - polystyrene 79–85
- - role of surface contaminants 98–101
- - summary of changes 94–96
- - surface energy 102, 103
- model 71
- oxidation, *see also* post-plasma oxidation 21
- oxidative aging of polymers 11
- oxygen incorporation from air 230
- oxygen plasmas
 - degradation of polymers 181–185
 - - PET 182, 183
 - monosort functional group modifications 251–256

p

- parallel plate reactors 47
- peel strength 209–212
- Penning ionization 41, 355, 364
- pentafluorobenzaldehyde (PFBA) 413
- peroxy/peroxide formation 16, 21
- phosphorescence 41, 162, 163
- photo-oxidation 65–67, 181
- photo-oxidative degradation 183, 184
- photosensitizers 65
- physical aging of polymers 11, 12
- plasma
 - atmospheric and thermal plasmas 50, 51
 - chemically active species and radiation 53
 - degree of ionization 37, 43, 44
 - energetic situation in low-pressure plasmas 49
 - gases 25
 - low-pressure 36, 37
 - reactors 47
 - state of 35–45
 - temperature 36, 37
 - types of low-pressure glow discharges 45–47
- plasma enhanced chemically vapor deposition (PECVD) 228
- plasma-chemically-initiated copolymerization 27, 28
- plasma edge sheath 39, 46
- plasma etch gravimetry 156, 157
- plasma-gas specific functionalization 25
- plasma-induced radical formation 62
- plasma-initiated chemical gas phase polymerization 27, 28
- plasma interactions with polymer surfaces
 - advantages and disadvantages 48, 49
 - atmospheric and thermal plasmas 50, 51
 - functional groups and interactions with other solids 29–31
 - influence of polymer type 23, 24
 - methods and definitions 24
 - - coating surfaces with functional group-bearing plasma-polymers 26–28
 - - crosslinking 29
 - - etching 28
 - - surface modification 25, 26
 - polymer characteristics 51, 52
 - special features of polymers 11–14
 - surface processes 14–23
 - - chain scissions 15
 - - cross-linking 20
 - - etching 19, 151–155

- graft reactions 18
- LMWOM boundary layer 17
- response to energy 15
- time scale 19
- plasma polymerization
 - adsorption layer or gas phase 345, 346
 - afterglow plasmas 364–366
 - applications 340, 341
 - copolymerization in continuous-wave plasma mode 368–370
 - dependence on plasma parameters 358–361
 - pressure dependence 360
 - energy distribution 359
 - historical perspective 337–340
 - kinetic models based on ionic mechanism 351–353
 - kinetic models on plasma-polymer layer deposition 353–358
 - mechanism 341
 - fragmentation–recombination 344, 345
 - ion–molecule reactions 344
 - radical chain-growth polymerization 342–344
 - plasma catalysts 367, 368
 - powder formation 366, 367
 - quasi-hydrogen plasma 348–351
 - side reactions 346–348
 - structure of plasma polymers 361–364
- plasma-polymer layer deposition 353–358
- plasma processes
 - exposure, ionizing irradiation and photo-oxidation 65–67
 - fluorination 64
 - introduction of plasma species onto polymer surfaces 55–63
- poly(acrylic acid) (PAA)
 - aerosol-DBD deposition 319
 - etching rates 153
- Polyamide-6 (PA-6) 153
- poly(amido amine) (PAMAM) 217, 219, 220
- poly(bisphenol-A carbonate) (PC)
 - DBD treatment 308
 - degradation behavior 158, 159
 - surface oxidation
 - kinetics 85–87
- polydimethylsiloxane (PDMS) 312
- Polyethylene (PE)
 - auto-oxidation 178
 - chain scission 15
 - comparison between cw-produced and pp-produced 392, 394, 395–397
 - DBD treatment 304
 - metallization
 - oxygen plasma pretreatment 202
 - radical production 178
 - surface oxidation
 - kinetics 75–78
 - VUV absorption spectrum 165
 - zip length 23
- Poly(ethylene terephthalate) (PET)
 - accelerated plasma aging 241
 - bromination 280, 281
 - DBD treatment 308, 309
 - degradation behavior 158, 159
 - oxygen plasmas 182, 183
 - etching rates 152, 153
 - macrocycles 170
 - metallization
 - chromium 222, 223
 - oxygen plasma pretreatment 202
 - NEXAFS 146, 147–150, 151
 - Norrish rearrangements 18
 - surface oxidation
 - kinetics 87–93
- Poly(isobutylene) (PIB)
 - zip length 23
- Polyhedral oligomers of silsesquioxanes (POSS) 217–220, 273–276
- Polymer dendrite structure 175
- Polymer nanocomposites (PNCs) 282, 283
- Polymerization using DBD 311, 312
- Polymers
 - anisotropic 18
 - characteristics 51, 52
 - degradation 14, 17
 - molar mass distribution 13
 - oxidative aging 11
 - physical aging 11, 12
 - surface energy 17
- Poly(methyl methacrylate) (PMMA)
 - etching rates 152, 153
 - topography of ESI deposition 330–332
 - VUV absorption spectrum 165
 - weight loss on exposure to cw-rf plasma 155
 - zip length 23
- Poly(α -methylstyrene) (PAMS)
 - zip length 23
- Polyolefins
 - bromination 279, 280
 - change of surface functionality 277, 278
 - grafting onto bromine groups 271, 272
 - using allyl bromide plasma 269, 270
 - using bromoform or bromine plasmas 265–269

- – yield density of grafted groups 272–277
 - DBD treatment 304–311
 - improving metal–polymer adhesion 320, 321
 - metallization
 - – oxygen plasma pretreatment 203
 - surface amination 120–123
 - surface hydrogenation 120–123
 - surface oxidation
 - – kinetics 72, 73
 - unsaturation formation 165
 - poly(oxymethylene) (POM)
 - etching rates 153
 - macrocycles 171
 - poly(phenylquinoxaline) 110
 - polypropylene (PP)
 - auto-oxidation 178
 - DBD treatment 304, 306–308
 - etching rates 153
 - metallization
 - – oxygen plasma pretreatment 202
 - NEXAFS 151
 - radical production 178
 - radio-frequency discharge in nitrogen 21, 22
 - surface oxidation
 - – kinetics 78, 79
 - unsaturation formation 167
 - weight loss on exposure to cw-rf plasma 154
 - polysort oxygen-containing groups 17
 - polystyrene (PS)
 - auto-oxidation 178
 - comparison between cw-produced and pp-produced 391, 392–394, 397–399
 - DBD treatment 308
 - degradation behavior 158, 159
 - etching rates 152
 - metallization
 - – chromium 223
 - – oxygen-treated plasma ThFFF 169
 - – radical production 178
 - – surface oxidation
 - – kinetics 79–85
 - – VUV absorption spectrum 165
 - – zip length 23
 - polytetrafluoroethylene (PTFE)
 - auto-oxidation 178
 - metallization 198
 - – aluminium 221
 - – reductive plasma pretreatment 207–210, 211
 - radical production 178
 - polyurethane
 - unsaturation formation 166
 - poly(vinyl acetate) (PVAc)
 - etching rates 152
 - poly(vinyl alcohol) (PVA)
 - etching rates 153
 - poly(vinyl chloride) (PVC)
 - unsaturation formation 165
 - poly(vinyl pyrrolidone) (PVP)
 - etching rates 153
 - poly(vinylpyrrolidone)
 - aerosol-DBD deposition 318–320
 - post-plasma oxidation 20–22
 - powder formation 366, 367
 - pressure-pulsed plasma 385–389
 - pseudo-copolymers 368, 369
 - pulsed-plasma polymerization 377
 - aging of polymers 401, 402
 - background 377–381
 - compared with cw polymerization 379
 - comparison between radical and pulsed-plasma polymerization 389–391
 - copolymerization
 - – acrylic acid and styrene 443–445
 - – allyl alcohol copolymers with ethylene, butadiene and acetylene 427–434
 - – allyl alcohol copolymers with styrene 434–443
 - – allylamine 445–447
 - – kinetics 427
 - – rationale 424–427
 - – dark reactions 384, 385
 - deposition rates 380
 - functional groups carrying polymer layers 403
 - – acrylic acid 416–421
 - – acrylonitrile 421, 422
 - – allyl alcohol 403–413
 - – allylamine 413–416
 - – graft polymerization 447–450
 - – grafting onto functional groups 450, 451
 - presented work 381
 - pressure-pulsed plasma 385–389
 - role of monomers 382–384
 - surface structure and composition 391–401
 - VUV-induced plasma 422–424
 - pulsed-plasma polymerization 27, 28
 - pyramidal polymer crystal structure 175
 - pyridine oxide 110
- q**
- quasi-hydrogen plasma 348–351

r

- radiation absorption by polymers 162–165
- radical chain-growth polymerization
 - 342–344
 - kinetic models 353–358
- radio-frequency (rf) produced plasmas 46, 47
- random degradation 183
- ratio of chain propagation 343
- Rayleigh limit 325
- reactors 47
- recombination radiation 42
- rubber, natural
- etching rates 152
- Rydberg transitions 146, 246

s

- Schottky equation 44
- selectivity for plasma polymerization 56
- selectivity of plasma processes 14
- self-assembled monolayers (SAMs)
 - ammonia plasma treatment 110, 111
 - oxidation 73
 - self-exciting electron resonance spectroscopy (SEERS) 378
- size-exclusion chromatography (SEC) 154, 175
- spacer molecules 214, 215, 218, 219
- grafting onto OH and Br groups 275
- spherulite structures 175
- standard dissociation energy (SDE)
 - aliphatic compounds 343
- standard enthalpy 13
- Stille mechanism 339
- styrene 369
 - copolymers with acrylic acid 443–445
 - copolymers with allyl alcohol 428, 434–443
- substitution 55
- sun, spectral distribution 243
- superelastic collisions 40, 41, 365, 366
- supermolecular polymer structure changes 145–151
 - crosslinking versus degradation of molecular masses 175–177
 - degradation 171–174
 - different degradation with oxygen plasma 181–185
 - PET 182, 183
 - photo-oxidation 181
 - plasma susceptibility of polymer building blocks 158–160
 - plasma UV irradiation 160–162

- plasma-induced effects 156
- radicals and auto-oxidation 177–181
- surface topology changes 155–157
- surface dynamics 12
- surface energy of polymers 17
 - polypropylene storage 232, 233
- surface functionalization of polymers 25, 26, 56–58, 185–194
 - broad spectrum functionalization 59
 - carbon dioxide plasmas 123–126
 - chlorination 134–136
 - fluorination 64, 126–134
 - grafting onto radical sites 294, 295
 - C-radical sites 295, 296
 - plasma ashing 297
 - post-plasma radical quenching 296, 297
 - radical types 295
 - graphitic surfaces 281
 - amination 289–292
 - amine grafting to brominated surfaces 288, 289
 - bromination efficiency 288
 - bromination rate dependence upon plasma parameters 286, 287
 - bromination with alternative precursors 287
 - bromination with bromine plasma 281–286
 - refunctionalization of brominated surfaces to OH groups 289
 - kinetics 69–71
 - monosort 59
 - noble gas plasmas 136–139
 - polymer surface amination
 - ammonia plasma treatment 103–109
 - ATR-FTIR 115–117
 - CHN analysis 117, 118
 - instability caused by post-plasma oxidation 110
 - NMR 118–120
 - self-assembled monolayers (SAMs) 111, 112
 - side reactions 109, 110
 - ToF-SIMS investigations 114, 115
 - XPS elemental composition measurement 112–114
 - polymer surface oxidation
 - aliphatic self-assembled monolayers 73–75
 - categories of changes from oxygen plasma 97–99
 - poly(ethylene terephthalate) (PET) 86–94

- – polycarbonate 85, 86
- – polyethylene 75–78
- – polyolefins 72, 73
- – polypropylene 78, 79
- – polystyrene 79–85
- – role of surface contaminants 100–102
- – summary of changes 94–96
- – surface energy 102, 103
- polyolefin surface hydrogenation and amination 120–123
- selective monosort 59
- SiO_x deposition 292–294
- thiol-forming plasmas 126
- unspecific functionalization by gaseous plasmas 72
- surface modification 25, 26
- surface topology changes 155–157
- surface-enhanced infrared absorption (SEIRA) 73

t

- Taylor cone 325
- temperature of plasmas 36, 37
- tensile shear strength 206
- tetramethylsiloxane (TMSO) 312
- thermal flow field fractionation (ThFFF)
 - degradation of polymers 176, 177
 - oxygen-treated plasma polymers 168, 169
 - polystyrene 83
- thin polymer film deposition 312–320
- thiol-forming plasmas 126
- Tibbitt model 339, 357
- time-delayed transition 41
- time-of-flight secondary ion mass spectrometry (ToF-SIMS)
 - amination of polymer surfaces 114, 115
- Townsend coefficient 39
- trans-crystalline structure 225
- trifluoromethylbenzaldehyde (TFMBA) 413
- triplet-triplet annihilation 41

u

- ultra-accelerated artificial aging of polymers 241
- ultrathin polymer film 312
- unsaturation formation 165–169
- UV irradiation 160–162

v

- vacuum ultraviolet (VUV) irradiation 160–162
- absorption spectra 165
- bond scission 245
- polymer response to long-term plasma exposure 239, 240
- polymerization 422–424
- Vitride® (Na-bis[2-methoxyethoxy]aluminium hydride) 253, 255
- Volmer–Weber growth mechanism 330, 331

w

- weak boundary layer (WBL) 150
- metallization of polymers 204

x

- X-ray photo-electron spectroscopy (XPS)
 - amination of polymer surfaces 112, 113
 - derivatization of functional groups 185–194

y

- Yasuda 338
- atomic polymerization 339, 353, 354, 357, 358
- pseudo-kinetic model 355, 356
- Yasuda factor 338

z

- zip length 23