

Index

- A-ring, 184, 185
- Abaca, 403
- Acetic anhydride, 345, 347, 348, 349
- N*-Acetylglucosamine, 525, 526
- Activated carbon, 263–264
- Acyclic alditols, 90
- Adhesive tack, 78–79
- Adhesives, 485–486
- Agar, 292–293, 298
- Agaropectin, 293
- Agarose, 293, 508
- Aldaric acids, 98, 100–102, 106
- Alditol-based polyesters, 97
- Alditol monomers, 95, 105
- Alditols
 - anhydroalditols, 90–95
 - O*-protected alditols, 95–97
 - unprotected alditols, 97–98
- Aldonic acids, 98–99
- Algae, 13
- Algarobilla chilena, 181
- Alginate, 164, 293, 294, 298, 502–506, 527
- Aliphatic macromonomers, 308, 310, 312, 316
- Alkenyl lignins, 263
- N*-Alkyl-aminolactitols, 165
- 6-*O*-Alkyl cellulose, 360
- Alkyl glycosides, 155
- Alkyl polyglycosides and analogues, 159–165
- Alternating copolycarbonates, 92
- (*S*)-5-Amino-4-hydroxypentanoic acid, 107
- 5-Amino-5-deoxy-*D*-xyloonic acid, 107
- 5-Amino-5-deoxy-*L*-arabinonic acid, 107
- Amino- and diaminoalditols, 105–106
- Aminoaldonic acids, 102, 106–108
- Aminodeoxycellulose, 355
- Aminosugars
 - amino- and diaminoalditols, 105–106
 - aminoaldonic acids, 106–108
 - diaminoanhydroalditols, 102–104
- Amylopectin, 322, 323, 325
- Amylose, 323, 325
- Anhydroalditols, 90–95
- Animal biomass, 13
- Animal resources
 - cellulose whiskers, from molluscs, 14
 - chitin and chitosan, 13–14
 - proteins, 14
- Anionic polymerization, 125–127
- Annual plants, 9
 - hemicelluloses, 11–12
 - mono and disaccharides, 12–13
 - starch, 10–11
 - vegetable oils, 11
- Anticancer activity, 193
- Anticavity effectiveness, 193
- Antimicrobial activity, 193, 523, 530, 533
- Antipollution flocculating agents, 180
- Antitumour activity, 193
- Antiviral activity, 194, 195, 196, 197
- Antiviral effectiveness, 193
- Arabinogalactan, 290, 291, 292, 298
- Arabinomethylglucuronoxylan, 290
- L*-Arabinose, 107
- Arabinoxylan, 289–290, 291, 292
- Aregic polyamides, 106
- Aromatic monomers from lignin, 265–269
- Artificial blood vessels, 380
- Artificial pancreas, 531
- Autohydrolysis, 237

- B-ring, 184
- Bacterial cellulose, 15, 345
 - from *Glucanacetobacter xylinus*
 - applications, 371, 378–382
 - properties, 373–378
 - structure of, 372
 - synthesis, 370–373
- Bacterial polymers
 - bacterial cellulose, 15
 - poly(hydroxyalkanoates), 14–15
- Bacterial synthesis
 - of polyhydroxyalkanoates, 454–456
 - of polyhydroxybutyrate, 455
- Bananas, 322, 323
- Bark, 179
- Bast/stem fibres, 402
- Betula pendula*, 308, 310
- Binding mechanism, of metal ions to chitosan, 527
- Biocompatibility, of chitosan, 530

- Biodegradability
 of chitosan, 530
 for poly(ester carbonate), 92
- Biodegradable cationic surfactants, 170
- Biodegradable epoxide-containing polyesters, 98
- Bioerodible polymers, 97
- Biorefineries, 237
- Bitumen emulsions, 169–170
- Black mimosa, 181
- Black wattle, 181
- Blend and composite materials, 487–492
- Blends
- Bolaamphiphile, 154, 170, 171–174
- Bone regeneration, 531
- Bulk lignin oxypropylation, 263
- Canola oil, 40, 41, 62
- Carbohydrate-based polymers, 102
- Carbohydrate-based surfactants, 154, 155
 alkyl polyglycosides and analogues, 159–165
 fatty acid glucamides, 165–166
 sorbitan esters, 166–167
 sucrose esters, 155–159
- Carbohydrate monomers *see* Sugar-based monomers
- Carbon fibres, 263, 265
 activated carbon, 263–264
- N, N'*-Carbonyldiimidazole, 351–352
- N*-Carboxyanhydride, 107
- N*-Carboxybenzyl chitosan, 528
- Carboxymethyl cellulose (CMC), 527
- 2,3-*O*-Carboxymethyl cellulose (CMC), 359
- N*-Carboxymethyl chitosan, 528
- Carboxymethyl function, 343
- Carboxymethylcelluloses, 498–501
- Cardboard adhesives, tannins, 191
- Carotenoids, 172
- Carrageenan, 292, 293, 298, 506–509, 527
- Casein, 484
- Cassava, 322, 323, 325
- Castalagin, 182
- Castalin, 183
- Castor oil, 40, 41, 42, 43, 45, 53
- Catechol B-rings, 187
- Cationic and carboxymethylated fibres, 501
- Cationic emulsifiers, 168–170
- Cationic polymerization, 22, 123–125
- Cationic starch, 502
- Cellulose, 4
 etherification of, 355
N, N'-carbonyldiimidazole, activation with,
 351–352
 completely functionalized cellulose ether, 363
 regioselectively functionalized cellulose ether,
 356–361
 homogeneous acylation, 345–353
 dialkylcarbodiimide, activation with, 350–351
 iminium chlorides, activation with, 352–353
 with *in situ* activated carboxylic acids, 348
 sulphonic acid chlorides, activation with, 348–350
 nucleophilic displacement reactions, 354–355
 solvents
 derivatizing solvents, 344
 non-derivatizing solvents, 345
- Cellulose acetate, 344, 346
- Cellulose-based composites, 401
 natural fibres, 402–405
 chemical composition, 404
 physical properties, 405
 processing, 406
 properties, 406
 fibre aspect ratio and length distribution, 410
 fibre dispersion, 409
 fibre–matrix adhesion, 411–412
 fibre orientation, 410–411
 fibre volume fraction, 407–409
- Cellulose dissolution, 344
- 6-*O*-Cellulose ethers, 360
- Cellulose ethers, 355, 356–363
- Cellulose fibres, 284–286
 surface modification strategies, 386
 acids and anhydrides, coupling with, 386–388
 admicellar configurations, modification by,
 395–396
 cellulose–inorganic particle, hybrid materials,
 396–397
 electrical discharges and irradiation techniques,
 393–395
 free-radical initiation, 390–392
 isocyanates, coupling with, 389–390
 ring opening polymerization, 392–393
 self-reinforced composite, 397
 silane coupling agents, grafting with, 388–389
- Cellulose–inorganic particle, hybrid materials, 396–397
- Cellulose ionic derivatives
 carboxymethylcelluloses, 498–501
 cationic and carboxymethylated fibres, 501
- Cellulose triacetate, 345
- Cellulose whiskers, from mollusks, 14
- Cement superplasticizers, 192–193
- Charge parameter, 496
- Chemical composition, 308–309
- Chemically modified lignins, 249–252, 260
 alkenyl lignins, 263
 bulk lignin oxypropylation, 263
 epoxy resins, 262–263
 polyurethanes, 260–262
- Chestnut, 181, 182, 183
- Chiral Nylon 3 analogues, 108

- α -Chitin, 521, 524
- β -Chitin, 521, 524
- Chitin, 13–14, 280, 517
 - applications in
 - agriculture, 532
 - cosmetics, 533–534
 - food industry, 532–533
 - medicine and pharmacy, 530–532
 - and chitosan, characterization of, 521–526
 - crystallinity, 524
 - degree of acetylation, 521
 - molecular mass determination, 521–524
 - solution properties, 525–526
- isolation of, 518
 - decolouration, 520
 - demineralization, 520
 - deproteinization, 520
 - raw material conditioning, 519
 - metal ions, interaction with, 526–527
- Chitinolytic microorganisms, 532
- Chitosan, 14, 280, 281, 518
 - applications in
 - biomaterial field, 530–531
 - agriculture, 532
 - cosmetics, 533–534
 - food industry, 532–533
 - medicine and pharmacy, 530–532
 - and chitin, characterization of, 521–526
 - crystallinity, 524
 - degree of acetylation, 521
 - molecular mass determination, 521–524
 - solution properties, 525–526
 - metal ions, interaction with, 526–527
 - in polyelectrolyte complexes, 527–530
 - preparation of, 520–521
 - in tissue engineering, 530, 531
- Chitosan–alginate, 498
- Chitosan *N*-benzyl disulphonate, 528
- Chitosan nanoparticles, 532
- Cholesteric polycarbonates, 94
- Cholesteric polyesters, 93, 97
- Cholesteric polymers, 93
- Chrome tanning, 186
- Citronellol, 31
- Cleaners, 161
- Cleansing cosmetics, 161
- Cold-setting lamination, tannins, 191–192
- Colloidal nature, of tannin, 188
- Complete methylation, 363
- Condensed (polyflavonoid) tannins, 181, 184–185
- Conformational transition, 507
- Conjugated oligomers and polymers
 - poly(2, 5-furylene vinylene), 139–142
 - polyfuran, 138–139
- Cooperative H-bonds, 497
- Copolymerizations
 - of limonene, 30–31
 - of monoterpene alcohols, 31–32
 - of α -pinene with synthetic monomers, 25
 - of β -pinene with synthetic monomers, 24–25, 26–28
 - using pinenes, 29–30
- Cork, 280, 282, 283, 284, 306
 - oxypropylation, 307–308
- Corn oil, 40, 41, 43, 44
- Corona treatment, 420, 421
- Cottonseed oil, 40, 41
- Cross-linked chitosan, 528
- Crosslinking of
 - modified oils forming interpenetrating networks, 47–48
 - vegetable oils, by vinyl monomers, 44–46
 - virgin oils, 46–47
- Crystallinity, of chitin, 524
- Curdlan, 294–295, 298–299
- Cyclic polyesters, 93
- Cytotoxicity, 194, 195, 196, 197
- Deacetylation, of chitin, 518, 520
- Dehydrogenation polymers *see* Dehydropolymerizate
- Dehydropolymerizate (DHP), 209–210
- Demineralization, chitin isolation by, 519, 520
- Dendrimers, 145, 147–149
- Dental wounds, 379–380
- Deoxycellulose, 355
- Deproteinization, chitin isolation by, 519, 520
- Derivatizing solvents, 344
- Destructured starch, 328
- Dextran, 296, 299
- 2,5-Diamino-1,4:3,6-dianhydrohexitol, 104
- 2,3-Diamino-1,4-anhydro-anhydroalditols, 104
- 1,4:3,6-Dianhydrohexitols, 90, 92
- 2,3-Di-*O*-acyl-L-tartaric acid, 100
- 2,3-Di-*O*-hydroxyethyl cellulose (HEC), 359
- 2,3-Di-*O*-hydroxypropyl cellulose (HPC), 359
- 2,3-Di-*O*-methyl-D- and -L-tartaric acids, 100
- 2,3-Di-*O*-methyl-L-tartaric acid, 100
- 2,4;3,5-Di-*O*-methylene-D-gluconic acid, 98
- 2,6-Di-*O*-TDS cellulose, 358
- Diels–Alder (DA) reaction, application of, 72
 - to furan polymers, 142
 - linear step-growth polymerization, 144–145
 - networks and dendrimers, 145
 - reversible crosslinking of linear polymers, 145–147
- 4,4'-Diphenylmethane diisocyanate, 190
- Dialkylcarbodiimide, activation, 350–351
- Diamino-sugars, 102
- Diaminoalditol monomers, 105

- Diaminoanhydroalditols, 102–104
 Diaminosaccharides, 102
 Dianhydroalditol-based polymers, 90
 Dianhydrohexitols, 103
 Dilute solution properties, of chitosan, 526
 Disaccharides, 12–13
 Dispersible papers, 501
 Dithiocarbamate chitosan, 527, 528
 Divi-divi, 181
 DNA separation, 380
 Drug/gene delivery, 173
 Drug-release systems, chitosan as, 523, 531
 Drug sustained-release formulations, chitosan for, 531
- Electronic paper, 381–382
 Electrostatic complex, 498
 Electrostatic interactions, 498
 α -Eleostearic acid, 43
 Ellagic acids, 181
 Emulsion polymerization, 78
 Enzymatic degradability, 91, 92
 Enzymatic polycondensation, 96
 Epoxidized oils, modification of, 48–53
 Epoxy resins, 94, 260, 262–263
 Esterification
 - of cellulose, 343, 348, 350, 351, 353, 354, 387
 - of wood, 421–425
 Etherification
 - of cellulose, 355–363
 - of wood, 425–426
 European Detergent Regulation, 174
 European Inventory of Existing Commercial Chemical Substances (EINECS), 175
- Fatty acid chlorides, 347
 Fatty acid esters, of polyglycerols, 167
 Fatty acid glucamides, 165–166
 Fatty acids, 40, 41–42, 62
 Fibre
 - dispersion, 409
 - orientation, 410–411
 - ratio and length distribution, 410
 - sources, 403
 - volume fraction, 407–409
 Fibre–matrix adhesion, 411–412
 Fibre reinforcement, 381
 Films and sheets, 484–485
 Firs, 181
 Fischer glycosidation, 160
 Fish oil, 40, 41
 Flax, 403, 404, 405
 Flocculation, and chitosan, 533
 Flotation agents, 180
 Fluidifying agents, for drilling mud, 180
 Foaming and detergency, 162
- Formaldehyde emission, 180, 190
 Fortification, 188
 Free-radical initiation, 390–392
 Free radical polymerization, 123
 Fuel cell membranes, 382
 Fully sugar-based polyamides, 101
 2,3-*O*-Functionalized esters, 354
 Furan heterocycle, 116–118
 Furan monomers, 120–122
 Furan polymers
 - aging of, 149–150
 - application of DA reaction, 142–147
 - and conjugated oligomers, 138–142
 - polyamides, 132–135
 - polyesters, 130–131
 - polyurethanes, 135–136
 Furanose-type headgroups, 172
 Furanosides, 163
 Furfural (**F**), 11, 118–120
 - resinification of, 127–128
 Furfuryl alcohol (**FA**)
 - reaction with wood, 427–428
 - self-condensation of, 128–130
 Furniture-care products, 161
- Galactaric acid, 100
 Galactaric acid-segmented silicones, 108
 Galactoglucomannan, 290–291
 - ionic derivatives, 511
 D- and L-Galactono-1,4-lactones, 107
 Galactose, 172
 Gallic acid, 181
 Gelatinization/destruction, 325
 Gelation, 504, 505, 508, 509, 510
 Gellan, 296, 297, 299
 Gemini surfactants, 170–171
 Gene delivery systems, 527, 532
 Gene therapy, 527
 β -Glucans, 294, 298
 D-Glucaric acid, 100
 D-Glucitol, 90, 102
 Glucomannan, 290
 D-Glucosamine, 104, 106, 107, 108, 525
 D-Glucose, 104, 106, 107
 Glucose, 155
 D-Glucuronolactone, 172
 Glucuronoxylan, 298
 Glutamic acid, 172
 (*S*)-(+)-Glutamic acid, 107
 D-Glyceraldehyde, 108
 Glycerol, 11, 167
 D-Glycosylamine, 108
 Glycine betaine, 169, 172
 Glycitol, 90
 Grafted lignins, 260

- Grafting
by electrical discharges, and irradiation techniques, 393–395
- Granules disruption, 325–327
- Graphitic materials, 263–265
- Grasses and reeds, 402
- Green surfactants, 12
- β L-Guluronic acid, 293, 294
- Halodeoxycellulose, 355
- Hardwoods, 202, 205, 207, 214
- Helix–coil transition, 506
- Hemiacetals, 189
- Hemicelluloses, 6, 11–12, 289
application, 298–299
properties, 289–297
- Hemlock bark extract, 184
- Hemp, 403, 405
- Heparin, 527, 530
- Hexamine, 189
- Hide-powder method, 185
- High molecular weight tannins, 189
- Homogeneous acylation, 345–353
N, N'-carbonyldiimidazole, activation with, 351–352
dialkylcarbodiimide, activation with, 350–351
iminium chlorides, activation with, 352–353
with *in situ* activated carboxylic acids, 348
sulphonic acid chlorides, activation with, 348–350
- Honeymoon' fast-setting, 192
- Hydrocolloid gums, 188, 189
- Hydrolysable tannins, 181–183
- Hydrolytic degradation, 96, 106
- Hydrophilic polyamides, 104
- Hydrophobic association, 526
- N*-(2-Hydroxy-3-mercaptopropyl) chitosan, 527, 528
- Hydroxyalkyl function, 343
- Hydroxylated nylons (polyhydroxypolyamides), 100
- Hydroxymethylfurfural (**HMF**), 12, 120
- Industrial cleaning agents, 161
- Industrial tannin adhesives
cold-setting lamination, 191–192
corrugated cardboard adhesives, 191
tyre cord adhesives, 192
wood adhesives, 188–191
- Interpenetrating networks, 47–48
- Interpolyelectrolyte reactions, cooperativity of, 529
- Interpolymer complexes, 527
- Ion-exchange properties, 505
- Ionic liquids (IL), 345, 346
- Ionic selectivity, 497
- Isocyanates
reaction with
cellulose, 389–390
wood, 426
- Isoidide, 90
- Isomannide, 90
- 3-*O*-*Iso*-pentyl, 360
- 1,2-*O*-Isopropylidene-D-xylofuranose, 108
- Isosorbide, 90
- Jute, 403, 404, 405
- Kenaf, 402, 403
- Kraft lignin, 216–219, 230
applications, 234
main producers, 234
production process, 231–232
properties, 232–233
- Kraft pulping process, 230, 231, 232
- Lactic acid, 13
condensation and coupling of, 436
copolymers based on, 438–439
synthesis, 435–436
- L-Lactide, 108
- Lactide
depolymerization, 436
ring-opening polymerization (ROP) of, 437–438
- Lactones, 98–99
- Lactose, 155
- Leaf/hard fibres, 402
- Leather, 180
- Leather manufacture, and tannins, 185–186
- Licanic acid, 43
- Lignin amine derivatives, 232
- Lignin carbohydrate complex (LCC), 207, 209
- Lignin heterogeneity, 214–215
- Lignin surfaces and interfaces, 265
- Lignins, 4–6, 512
aromatic monomers from, 265–269
biosynthesis of monolignols, 202–205
carbon fibres, 263, 265
activated carbon, 263–264
content of, 206
distribution, 206
formation of, 202–205
graphitic materials, 263–265
kraft lignin, 216–219
as macromonomers, 252
chemically modified lignins, 260–263
unmodified lignins, 253–260
nomenclature of, 202
as physical components
chemically modified lignins, 249–252
unmodified lignins, 244–249
potential sources of, 237–238
sources of, 205
dehydropolymerizate, 209–210
milled wood lignin, 206–209

- Lignins, (*continued*)
- steam explosion lignin, 220
 - structure of, 210
 - β -*O*-4 linkage, 212–214
 - lignin heterogeneity, 214–215
 - native lignin, 215–216
 - nuclear magnetic resonance, 211–212
 - wet chemistry methods, 211
 - sulphite lignin, 219–220
 - surfaces and interfaces, 265
- Lignocellulosic fibres, 402, 405, 406, 409
- Lignosulphonates, 219, 220, 226, 512
- Limonene, 30, 31
- Linalol, 31
- Linear step-growth polymerization, 144–145
- β -*O*-4 Linkage, in lignin, 212–214
- Linolenic acid, 43
- Linseed, 403
- Linseed oil, 40, 41, 43, 44
- Lipase, 530
- Liquid crystalline self-organisation properties, 163
- Living cationic polymerization, 28
 - copolymerization of (-pinene), 26–28
 - homopolymerization of (-pinene), 25–26
- Local stiffness, of ionic polysaccharides, 498
- Long chain aliphatic esters, 347
- Low toxicity, of chitosan, 530
- Lysozyme, 530
- Maize, 322, 323, 325, 334
- Mangrove, 181
- Mannan, 289
- D-Mannaric acid, 100
- D-Mannaro-1,4:6, 3-dilactone, 100
- D-Mannitol, 90, 98, 106
- β D-Mannuronic acid, 293, 294
- Medium density fibreboard (MDF), 191
- Metal ions
 - adsorption capacity of, 527
 - adsorption, by biopolymer, 527
 - interaction with chitin and chitosan, 526–527
- 3-*O*-Methoxyethyl-2,6-di-*O*-acetyl cellulose, 361
- 2,3-*O*-Methyl cellulose, 360
- Methyl function, 343
- Methylglucuronoxylan, 290
- Milled wood lignin (MWL), 206–209
- Mimosa, 179
- Minimum Cytotoxic Concentration (MCC), 193
- Minimum Inhibitory Concentration (MIC), 193
- Moisture uptake, 328
- 3-Mono-*O*-alkyl cellulose, 360
- 3-Mono-*O*-ethyl cellulose, 361
- 3-Mono-*O*-functionalized cellulose ethers, 360
- 3-Mono-*O*-methyl cellulose, 360
- 6-Mono-*O*-trityl cellulose, 359
- Monolayer vesicles, 173
- Monolignols, biosynthesis of, 202–205
- 6-*O*-(4-Monomethoxytrityl) cellulose (MMTC), 359
- Monosaccharides, 12–13
- Monoterpenes, 18, 19
 - radical polymerization of, 28–32
- MUF resins, 186
- Myrabolans, 181
- Myristic acid, 43
- Nanocomposites, 413–416
 - of PLA, 446
 - and compsites, of TPS, 334–336
- Nata de coco*, 378
- Native lignin, structure of, 215–216
- Native structure, of suberin, 308
- Natural fibres, 402–405
- Natural rubber, 6–8
- Nematodes, 532
- NMR spectroscopy, 347, 351, 359, 361
- Non-derivatizing solvents, 345
- Non-ionic cellulose ester, 350
- Non-statistical distribution, 361
- Nuclear magnetic resonance (NMR), 211–212
- Oak, 181
- Oil/water emulsion, 161
- Oil-based alkyd resins, 58–60
- Oil-based poly(hydroxyalcanoates) (PHA), 60
- Oil-based polyamides, 56–57
- Oil-based polyester-amides, 57–58
- Oil-based polyesters, 58–60
- Oil-based polyurethanes, 56
- Oiticica oil, 41, 44
- Olefin system
 - dehydroabietic acid aromatic ring, functionalization of, 71
 - dehydrogenation, 70
 - Diels–Alder reaction, 72
 - formaldehyde and phenol, reactions with, 73–75
 - hydrogenation, 70
 - isomerization, 71
 - oxidation, 70
- Oleic acid, 43
- Olive oil, 40, 41
- Olive pits, 280–282
- Optically active polyamides, 106
- Ore flotation, 181
- Organosolv lignin
 - from Alcell process, 238
- Oxypropylation, 12, 307–308
- P3HB-*co*-3Hpropionate, 458
- P3HB-*co*-3HV, 458

- P3HB-*co*-3HV-*co*-5HV, 458
P3HB-*co*-3WHV-*co*-4HV, 458
P3HB-*co*-4HB, 458
P3HB-*co*-4HB-*co*-3HV, 458
Palm oil, 41, 42
Palmitic acid, 43
Palmitoleic acid, 43
Paper sizing, 76–78
Partial oxypropylation, 283
 cellulose fibres, 284–286
 starch granules, 286–287
Particleboard adhesives, 189, 190
Pectins, 527, 290, 292, 298, 509–511
Pentagalloyl glucose, 183
Pentaric acids, 101
Pentoses, 155
3-*O*-*n*-Pentyl, 360
Phenol–formaldehyde (PF) resins, 183, 253
‘Phlobaphenes’, 188
Phloroglucinolic A-rings, 187
 α -Pinene, 23–24, 25
 β -Pinene, 22–23, 24–25
Pines, 181
Pinus bark extract, 184
Plant-derived cationic emulsifiers
 for road construction and cosmetics, 168–170
Plasma treatment, 420, 421
Plastic production, , 327–328
Plasticizer, 461, 464, 466
Plastics, 486–487
Poly(2,5-furylene vinylene), 139–142
Poly(3-hydroxybutyrate-*co*-3-hydroxyvalerate) (PHBV),
 458, 464
 physical properties, 460
Poly(acrylic acid), 527
Poly(ester amide)s, 100, 106
(Poly)glycerol ester-type surfactants, 154
Poly(hydroxyalkanoates), 14–15
Poly(sorbityl adipate), 98
Poly(urethane)s (PU), 253–255
Polyamides, 132–135
Polyelectrolyte complexes(PEC)
 and chitosan, 510
 chitosan in, 527–230
 membranes, 529
 network, 529
Polyelectrolytes, 11
 characterization, 495–498
Polyesters, 130–131, 255–260
Polyfuran, 138–139
Polyglycerols, 168
Polyhydroxyalkanoates (PHA), 451
 applications, 470–472
 bacterial synthesis of, 454–456
 genetic engineering, 458–459
 modification of, 466
 processing of, 468
 review of, 452–454
Polyhydroxybutyrate (PHB)
 ageing processes, 462–463
 bacterial synthesis of, 455
 crystallization, 461–462
 mechanical properties, 466, 468, 469
 secondary structure of, 459
 solubility, 463
 stabilization, 466
 thermal *cis*-elimination, in polymers, 465
 thermal degradation, 464–466
Polyhydroxylated Nylon 6 analogues, 107
Polylactic acid (PLA), 433
 biodegradation, 444–445
 biomedical applications, 447
 blends, 445–446
 decomposition temperature, 443
 fibres of, 447
 hydrolysis, 443
 materials based on, 447
 nano-biocomposites, 446
 as packaging applications, 447
 polymerization, 436–438
 processing, 445–446
 properties, 439–443
 crystallinity, 439–441, 445
 synthesis, 434
 lactic acid, copolymers based on, 435–436,
 438–439
 lactide, 436
Polymannaramides, 100
Polymers
 from chain reactions, 122
 anionic polymerization, 125–127
 cationic polymerization, 123–125
 free radical polymerization, 123
 stereospecific polymerization, 127
 from suberin monomers, 316–317
 from terpenes, 21–33
Polyol-based polyurethanes, 102
Polyols, 90, 167
Polysaccharide, 343, 346, 350, 351, 352
Polytartaramides, 100
Polyterpene applications, 33–34
 tack and adhesion, 33
Polyurethane foams, 282–283
Polyurethanes, 135–136, 260–262, 316, 317
Potatoes, 322, 323, 325
Printing inks, 82–84
O-Protected-6-amino-6-deoxy-D-allonate,
 107
O-Protected alditols, 95–97
Protecting groups, 356, 357, 359, 360

- Proteins, 14
 applications, as materials
 adhesive, 485–486
 blend and composite materials, 487–492
 films and sheets, 484–485
 plastics, 486–487
 denaturation, 482
 physicochemical properties, 481–482
 structures, 479–481
- Pullulan, 295–296, 299
 biosynthesis, 295
- Pyranose, 172
- Pyrogallol, 187
- Quebracho, 179, 181
- Quercus suber, 305, 306, 310
- Ramie, 403
- Random copolycarbonates, 92
- Rapeseed oil, 40, 41, 58
- Refined tall oil, 41
- Regioselective polymerization, 98
- Registration, Evaluation and Authorization of Chemicals (REACH), 174
- Resin acids chemical reactivity, 70–76
- Reversible crosslinking, of linear polymers, 145–147
- Rheological behaviour
 of chitin and chitosan, 526
- Rice, 322
- Ricinoleic acid, 43
- Ring-opening polymerization, 91, 98, 106, 108, 109, 392–393
- Rosin, 8–9
 applications and derivatives, 76–84
 adhesive tack, 78–79
 emulsification, 78
 paper sizing, 76–78
 printing inks, 82–84
 chemical composition, 68–69
- Scleroglucan, 295, 299
- Seaweed polysaccharides, 502
 alginates, 502–506
 carrageenans, 506–509
- Seed and fruit hairs, 402
- Self-assembling properties
 of Bolaform surfactants, 173
- Sensitivity to photo-oxidation, 186
- Shampoos, 161
- Silane coupling agents, grafting with, 388–389
- Silk dyes, 180
- Siloxanes reaction
 with wood, 426–427
- Single-component composites, 274
- Sisal, 403, 404, 405
- Soda lignin, 234
 applications, 236–237
 main producers, 237
 production process, 235–236
 properties, 236
- Softwoods, 205, 207, 218, 220
- Sorbitan esters, 166–167
- Sorbitol, 90, 98, 155
- Sorghum, 322
- Soy protein, 482–483
- Soybean oil, 41, 42, 43, 44
- ‘Span’, 166
- Starch, 10–11, 321
 crystallinity, , 324
 degradation, 330–331
 granule structure, 322–325
 disruption of, 325–327
 ionic derivatives
 cationic starch, 502
 starch phosphates, 502
 starch succinates, 501
 plastic production, 327–328
 sources, 322
 polymers, 327
 thermoplastic starch, 328
 blending, 331–334
 composites and nanocomposites, 334–336
 crystallinity, 329–330
 extrusion-cooking, , 330
 plasticizers, 329
- Starch blends, 332
- Starch granules, 286–287
- Starch phosphates, 502
- Starch succinates, 501
- Steam explosion, 237
- Steam explosion lignin, 220
- Stearic acid, 43
- Stereoregular AABB polyamides, 106
- Stereoregular polyamides, 100, 105
- Stereoregular sugar-based polyamides, 107
- Stereospecific polymerization, 127
- Stiffness, of chitosan chains, 526
- Straw fibres, 402
- Suberin, 8, 308
 depolymerization methods, 308–309
 as functional additive, 316
 physical properties, 312–315
 monomers, 309–312
 polymers from, 316–317
 native structure, 308
- Sucrose, 155

- Sucrose esters, 155–159
- Sugar-based Gemini surfactant, 171
- Sugar-based monomers
- aldaric acids, 100–102
 - alditols, 90–98
 - aldonic acids and lactones, 98–99
 - aminosugars, 102–108
- Sugar beet pulp, 278–280
- Sugar esters, 155
- Sulphitation, of tannins, 188
- Sulphite lignin, 219–220
- applications, 229–230
 - main producers, 230
 - production process, 226–228
 - properties, 228–229
- Sulphite pulping process, 226, 227
- Sulphomethylation, 232
- Sulphonic acid ester, 352, 354
- Sumach, 181, 184
- Sunflower oil, 40, 41, 44
- Superplasticizing additives, for cement, 180
- Supramolecular aggregates, 173
- Surface map, of bacterial cellulose, 373
- Surfactants, based on RRM, 167–168
- Synthetic bolaamphiphiles, 172
- Tack and adhesion, 33
- ‘Tanner’s red’, 188
- Tannin-based adhesives
- wood adhesives, 186–188
- Tannins, 8
- cement superplasticizers, 192–193
 - colloidal nature of, 188
 - content, determination of, 185
 - extraction, history of, 179–180
 - industrial tannin adhesives
 - cold-setting lamination, 191–192
 - corrugated cardboard adhesives, 191
 - tyre cord adhesives, 192
 - wood adhesives, 188–191
 - leather manufacture, 185–186
 - medical/pharmaceutical applications, 193–197
 - self-condensation, hardening by, 192
 - sensitivity to photo-oxidation, 186
 - sources, 180–181
 - structure
 - condensed (polyflavonoid) tannins, 184–185
 - hydrolysable tannins, 181–183
 - sulphitation of, 188
 - tannin-based adhesives, 186–188
 - uses, 181
 - in wine, 180
- Tara, 181
- L-Tartaric acid, 105
- Tartaric acid, 92
- α -Terpineol, 31
- Terpenes, 9
- Tert-butyltrimethylsilyl cellulose, 357
- 2,3,4,5-Tetra-*O*-methyl-D-galactono-1,6-lactone, 99
- 2,3,4,5-tetra-*O*-methyl-D-glucono-1,6-lactone, 99
- Thermoplastic starch (TPS), 328
- blending, 331–334
 - composites and nanocomposites, 334–336
 - crystallinity, 329–330
 - extrusion-cooking, , 330
 - matrices, 336
 - plasticizers, 329
- 6-*O*-Hexyldimethylsilyl (TDS) cellulose, 357
- Tissue engineering, chitosan in, 530, 531
- Tosyl cellulose, 355
- Total oxypropylation, 273
- chitin and chitosan, 280
 - cork, 280, 282, 283, 284
 - lignin, 275–278
 - olive pits, 280–282
 - polyurethane foams, 274, 278, 282–283
 - sugar beet pulp, 278–280
- Transdermal-drug delivery (TDD), 532
- Trehalose, 102
- Triglycerides, 42
- 2,3,4-Tri-*O*-methyl-D-xylose, 99
- 2,3,4-Tri-*O*-methyl-L-arabinaric (and xylaric) acids, 101
- 2,3,4-Tri-*O*-methyl-L-arabinaric acid, 96
- 2,3,4-Tri-*O*-methyl-L-arabinitol, 96
- 2,3,4-Tri-*O*-methyl-L-arabinonic acid, 98
- 2,3,4-Tri-*O*-methyl-L-arabinose, 99
- 2,3,4-Tri-*O*-methyl-xylaric acid, 96
- 2,3,4-Tri-*O*-methyl-xylitol, 96
- Tri-*O*-alkyl cellulose, 363
- 6-Trialkylammonium-6-deoxycellulose, 355
- Trimethylsilyl cellulose (TMSC), 363
- 6-*O*-Trityl cellulose, 353, 359, 360
- Tubular assemblies, 173
- Tung oil, 41, 43, 44
- Turpentine, 19–20
- applications, 20–21
 - polymers, 21
 - α -pinene, 23–24
 - β -pinene, 22–23
 - limonene, 30
- Tyre cord adhesives, 192
- Ultimate biodegradability, 174
- Ultra thin monolayer membranes, 173

- Unmodified lignins, 244–249
 - epoxy resins, 260
 - grafted lignins, 260
 - phenol–formaldehyde resins, 253
 - poly(urethane)s, 253–255
 - polyesters, 255–260
 - urea–formaldehyde resins, 253
- Urea–formaldehyde (UF) resins, 253
- Uronic acids, 155

- Valonea, 181
- Varnish primers, for metals, 180
- Vegetable oils, 11, 154
 - isolation of, 42
 - polymers from, 43–64
 - properties of, 41–42
- Vegetable resources
 - algae, 13
 - annual plants
 - hemicelluloses, 11–12
 - mono and disaccharides, 12–13
 - starch, 10–11
 - vegetable oils, 11
 - wood, 3
 - cellulose, 4
 - hemicelluloses, 6
 - lignins, 4–6
 - natural rubber, 6–8
 - suberin, 8
 - tannins, 8
 - terpenes, 9
 - wood resins, 8–9
- Vegetal biomass, 3
- Vemolic acid, 43
- Vescalagin, 182
- Vescalin, 183
- Virgin oils, crosslinking of, 46–47
- Vitamin C, 172

- Wet chemistry methods, by lignin, 211
- Wheat, 322, 323

- Wheat gluten, 483–484
- Wood
 - cellulose, 4
 - chemical modification of
 - composites of, 428–429
 - corona treatment, 420, 421
 - esterification reactions, 421–425
 - etherification reactions, 425–426
 - furfuryl alcohol, reactions with, 427–428
 - isocyanates, reactions with, 426
 - plasma treatment, 420, 421
 - siloxanes, reactions with, 426–427
 - hemicelluloses, 6
 - lignins, 4–6
 - natural rubber, 6–8
 - suberin, 8
 - tannins, 8
 - terpenes, 9
 - wood resins, 8–9
- Wood adhesives, 180
 - industrial tannin adhesives, 188–191
 - tannin-based adhesives, 186–188
- Wood fibres, 402, 409, 410, 411
- Wood resins, 8–9
- Wound healing, chitosan, 530

- Xanthan, 296, 297, 299
- Xylan, 289, 290, 291, 298
 - biodegradation of, 290
- Xylaric acid, 100
- Xylitol-based polycarbonate, 96
- Xyloglucan, 290
- d-Xylose, 107

- Yams, 322

- Zein, 334, 483

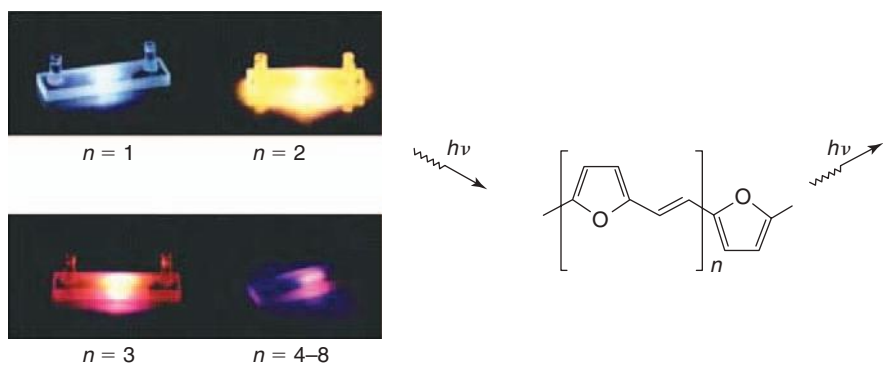


Figure 6.4 Photoluminescence of oligomers oligo(furylene vinylene)s with different lengths [57b].