

Index

a

acetylation of alginate 172–173
 Acticoat 116, 194, 195, 197–199, 202, 203, 206, 207, 210
 Actisorb Silver 220 196, 200, 210
 alginate 19, 25, 39
 acid hydrolysis of 22–23
 alginic acid fibers 68
 before and after purification 14–15
 calcium alginate fibers 61
 calcium sodium alginate fibers 65–66
 carboxymethyl cellulose 69–70
 chemical nature of 1
 fiber forming polymer 58–60
 film forming property 43
 gelling property of 42
 historical development of 76–77
 M/G ratios of 59
 polymeric structure of 20
 polymerization of 24
 silver containing alginate fibers 71–73
 silver novel alginate fibers 73–76
 sodium alginate fibers 66–68
 spinning solutions
 concentration of 61
 molecular weight of 60–61
 pH of 61
 temperature of 61
 zinc alginate fibers 69
 alginate based beads 41
 alginate based food gels 32, 40, 41, 43
 alginate based printing paste 48
 alginate coated welding rods 49
 alginate fiber based wound dressings 169
 alginic acid 169–178
 carboxyl groups
 esterification 173–174
 fiber making process 178–185
 chitosan composite fibers 183–185

containing drugs 182–183
 electrospinning 180–182
 metal ions and inorganic compounds 179–180
 polyblend fibers 180
 hydroxyl groups
 cyclodextrin-linked alginate 172
 oxidation 170–171
 reductive-amination of oxidized alginate 171–172
 sulfation 172
 structural hierarchy of 169, 170
 alginate fibers 57, 65, 83, 125
 chemical/physical structures of 126
 vs. copper ions 91–94
 functional wound dressings 118–119
 stages 77
 vs. zinc ions 87–91
 alginate films 33, 40, 43, 76, 119, 176
 alginate gel 30, 32, 40, 42, 45, 47, 146, 147, 172, 230
 alginate oligomers 45
 alginate products 2–5, 9, 10, 23, 24, 58, 120
 alginate wound dressings 71, 118, 119, 122, 145, 222
 absorbency test 126–127
 absorption mechanism of 128–129, 226
 absorption test 129
 alginate felt and rope 131
 alginate plaster 224
 anal fistula wounds 232
 applications of 223–226
 biocompatibility and bioactivities of 145–147
 biologically interactive property 138–139
 bleeding during treatment 159
 burn wounds 232
 burn wounds and donor sites 151–154

- alginate wound dressings (*contd.*)
- calcium alginate 222
 - calcium alginate fibers 226–227
 - calcium and sodium contents 133
 - carboxymethyl cellulose 134
 - in cavity wounds 160
 - characterization methods 126–128
 - clinical applications of 148–160, 225
 - composite dressings 160
 - cotton gauze 227
 - in diabetic foot ulcers 151
 - diabetic foot ulcer wounds 232
 - dry and wet strength 128, 137–138
 - enzyme inhibition property 139–142
 - fiber calcium and sodium contents 127
 - fluid retention fibers 130–131
 - gel blocking properties 135
 - gel swelling 127
 - guluronate and mannuronate contents 132–133
 - haemostatic agent for bleeding wounds 154–156
 - hemostatic properties 232–233
 - hydrogel 223
 - interactive moisture handling properties 138
 - ion exchange coefficient 228
 - in leg ulcers 149–151
 - leg ulcer wound 231–232
 - manufacturing processes 230
 - moist healing 223
 - needled nonwoven fabric 226
 - non-alginate products 130
 - nonwoven structures 133–134
 - in nose surgery 158–160
 - pain during treatment 159
 - patient comfort during treatment 160
 - properties of 160–163
 - antimicrobial properties of 163
 - cost effectiveness of 163
 - hemostatic properties of 162
 - reduce pain 229
 - residue alginate fibers 229
 - seaweeds production 233
 - sodium alginate 228
 - sodium alginate and calcium alginate 221
 - sterilization on absorption property 131–132
 - wet integral and dispersible 228–229
 - wet integrity test 127
 - wicking behavior 127, 135
- wound healing mechanisms 147–148
- alginic acid 1, 2, 221
- basic structural feature 19–20
 - C-5 epimerization and designer alginate 21–22
 - M/G ratio and distribution 20–21
 - molecular weight and distribution 22
- alginic acid fibers 65, 68, 88, 91–93, 179
- alginic acid method
- vs. calcium alginate method 9
- alginic acid to sodium alginate 8, 14
- alginic materials
- alginic acid
 - basic structural feature 19–20
 - C-5 epimerization and designer alginate 21–22
 - chemical stability 22–24
 - M/G ratio and distribution 20–21
 - molecular weight and distribution 22
- binders for fish feed 50
- bioactivities of
- biocompatibility and cell activities 34–35
 - enzyme inhibition activities 33–34
- biocatalysts immobilization 46–48
- biostimulants 50
- controlled release agents 48
- fiber forming properties 1, 33
- film forming properties 32–33, 42
- functional properties of
- encapsulation and immobilization 41
 - film-forming agent 40–41
 - gelling agent 40
 - stabilizer 41
 - thickening agent 39
- gelling properties of 31–32
- industrial applications of
- food ingredients 42–44
- ion exchange properties 29–31
- medical and pharmaceutical uses
- cystic fibrosis mucus 45–46
 - dental impression 44
 - drug control 45
 - mucin polymer network modifier 45
 - therapeutic cell entrapment 45
- paper sizing agent 48
- physical properties of 24–26
- polyelectrolyte properties 29
- textile printing paste 48
- viscosity solution 26–29
- concentration effect 27–28
 - molecular weight on 26

pH effect 29
 salt effect 28–29
 shear rate effect 28
 temperature effect 28
 welding rods coating 49–50
 wound dressings and hemostatic agent 46
Alphasan RC5000 72, 73, 198, 203–205
 amorphous hydrogels 110, 111
 amphiphilic alginate derivative (AAD) 181, 182
 anionic polysaccharide 1, 169
 antimicrobial agent 40, 71–73, 112, 193, 201, 203, 207, 213, 230
 antimicrobial test method 208
 challenge testing 208–209
 microbial transmission test 209–210
 zone of inhibition 208
 antimicrobial wound dressings 116–117
Aquacel Ag-ConvaTec 200
 artificial skins 117
Ascophyllum nodosum 2–4, 7, 29
Ascophyllum seaweeds 9
 asialoglycoprotein receptor (ASGPR) 176
Aspergillus niger spores 195
Azotobacter vinelandii 2, 21

b

Ba-alginate gels 14
Bacillus subtilis var 90, 91
 biostimulant 50
 British Drug Tariff 102, 106, 122
 alginate wound dressings 125
 brown seaweeds 1
 acid treatment 10–12
 alginic acid vs. calcium alginate 9
 alkaline extraction 12
 cultivation of 5–6
 distribution of 2–3
 extraction process 6–9
 flow chart for the extraction 7–8
 formaldehyde treatment 12
 global distribution of 2–6
 insoluble seaweed residue 12–14
 process control 9–10
 raw materials, size reduction of 10
 types of 2–4, 7
 ultrapure alginate 14–15
 wet and dry structure of 6
 burn wounds 116, 117, 145, 148, 151–154, 162, 195, 197, 207, 210, 232

c

calcium alginate 13, 65, 153
 dressings 125, 132, 156–158, 232
 gels 45, 173
 calcium alginate fibers 160
 production of 61–64
 vs. sodium ions 86–87
 calcium alginate method 9
 calcium silver alginate fiber 71
 calcium/sodium alginate dressings 133
 calcium/sodium alginate fibers 65, 91, 93, 98, 142
 calcium/sodium alginate wound dressing 133, 134, 145
Candida albicans 194, 196
 carboxyl groups 22, 170, 172, 176, 178, 185
 esterification 173–174
 carboxymethylated cellulose, 108
 carboxymethylated cellulosic fibers 108, 109
 carboxymethyl cellulose (CMC) 48, 69–70, 74, 106, 108, 110, 111, 134, 179, 180, 183, 185
 alginate wound dressings 133–134
 cavity wounds 105, 111, 148, 160, 163, 224
 CD-14 147
 cell immobilization 45, 47
 cellulosic fibers 108–109
 C-5 epimerization 21–22
 chitin fibers wound dressing 107–108
 chitosan 184
 composite fibers 183–185
 polyblend fibers 76, 184
 chitosan fibers 107–108, 184, 209
 wound dressing 107
 2-chloro-1-methylpyridinium iodide (CMPI) 174–175
 2-chloro-N-methyl pyridinium iodide (CMPI) 176
 chronic wounds 102, 117, 140, 163, 195, 200, 206–207
 collagen-alginate dressing 151
 composite wound care products 114–115
 Contrext foam-Coloplast 200
 cyclodextrin
 chemical structure of 173
 linked alginate 172
 cystic fibrosis mucus 45–46

d

diabetic foot ulcers 140, 145, 148, 151, 195, 197, 225, 232
 dicyclohexylcarbodiimide (DCC) 172, 174

dimethyl acetamide (DMAc) 107
 4-(*N,N*-dimethylamino) pyridine (DMAP)
 174
 dimethylsulfoxide (DMSO) 174
 dried brown seaweed 10, 11
 dried seaweed plant 10, 11

e

Ecklonia cava 5
 egg-box model 30
 electro-spinning 180–182
 epithelializing wounds 103, 104
Escherichia coli 21, 91, 146, 194, 209
 esterification 172–174
 1-ethyl-3-(3-dimethylaminopropyl)
 carbodiimide hydrochloride
 (EDC-HCl) 174
 extracellular matrix (ECM) 1, 140–141

f

fat liquefaction incision wound 157–158
 fiber forming polymer 58–60, 72, 203
 film-forming agent 40–41
 food ingredients 39, 42–44, 58
 foreign-body reaction 146

g

gelatin blend fibers 74
 gelling agent 40, 94
 gel swelling 65–66, 76, 84, 87, 96–97, 127
 glucono- δ -lactone (GDL) 31–32
 D-glucono-1,5-lactone 47
 graft copolymerization 177–178
 granulating wounds 103, 104
 Great Atlantic *Sargassum* Belt 4
 guluronic acid (G) 4, 20–22, 32, 45, 59–60,
 62, 86, 94, 98, 147, 155, 221–222, 228
 α -L-guluronic acid 2, 19, 58, 84, 125, 146,
 229
 α -L-guluronic acid units 59

h

hemostatic agent 46, 57, 145, 146, 154–156
 bleeding wounds 154–156
 hexuronic acid 169
 hydrocolloid wound dressings 111, 112
 hydrogels wound dressing 110
 hydroxyl groups
 cyclodextrin-linked alginate 172
 oxidation 170–171
 reductive-amination of oxidized alginate
 171–172
 sulfation 172

i

infected wounds 103, 105, 139, 197, 198,
 230
 interactive dressings 117
 ion-exchange
 alginate fibers vs. copper ions 91–94
 alginate fibers vs. zinc ions 87–97
 calcium alginate fibers vs. sodium ions
 86–87
 ion-exchange and gel forming property
 characterization methods 83–85
 wound dressings 83–84

l

Laminaria digitata 2–4, 7, 24
Laminaria hyperborea 2–4, 7, 29
Laminaria japonica 5
Laminaria species 4
 leg ulcer wound dressing 150, 231–232
Lessonia trabeculata 4, 5
 lipopolysaccharide (LPS) 34, 139, 147
 low adherent dressings 105, 113–114
 lower critical solution temperature (LCST)
 178

m

Macrocystis pyrifera 2–4, 7
 mannuronic acid (M) 4, 19, 20, 32, 59, 60,
 63, 86, 94, 98, 146, 155, 221, 228
 β -D-mannuronic acid 2, 58, 59, 84, 125,
 146, 229
 D-mannuronic acid 1, 2, 22, 58
 matrix metalloproteinases (MMPs) 69, 117,
 139, 140, 143, 206
 methicillin-resistant *Staphylococcus aureus*
 (MRSA) 116, 193
 microbial transmission test 208–210
 minimum bactericidal concentration (MBC)
 210
 minimum inhibitory concentration (MIC)
 210
 MMP-9 140–142
 moist healing principle 77, 102
 moist healing products 57, 102, 114
 moist healing wound dressings 57, 118
 moisture-vapor transmission rate (MVTR)
 138
 monomers 1, 19, 20, 32, 110, 177, 184, 221,
 222

n

necrotic wounds 103, 104
 Newtonian behavior 28

o

oligoelectrolytes 45, 46
oligoguluronates 45–46
organic soluble derivative alginate 175
oxidized alginate 170–172, 182, 184

p

paper sizing agent 48
peripheral vascular disease 151
phosphomannose isomerase (PIM) 194
poly-acrylamide (PAAm) 177, 178
poly-acrylic acid (PAA) 178
polyblend fibers 70, 76, 180–185
polyethylene glycol (PEG) 171, 172, 182
poly-2-dimethylamino-ethyl methacrylate (PDMAEMA) 178
polymer blending 74, 178
polymeric acid 1, 29, 58, 69, 71, 78, 91, 98, 125, 203, 221, 222, 227
polymerization (DP) 12, 21, 24, 29, 46, 61, 178, 222
poly-*N*-isopropylacrylamide (PNIPAAm) 178
polyurethane film and foam wound dressings 109–110
polyurethane foams 102, 110
poly-vinyl alcohol (PVA) 181, 182
propylene glycol alginate (PGA) 25, 75, 76, 173, 183, 184
Pseudomonas aeruginosa 24, 46, 73, 196

s

Saccharina japonica 2–7
Sargassum species 5
Scarlet Red ointment dressing 153
schiff bond formation 185
semi-permeable film dressings 109, 231
semi-permeable polyurethane film 109, 110
SilvaSorb-Medline 200
Silvercel wound dressing 199
silver containing alginate fibers 71
 antimicrobial efficacy of 194–195
 antimicrobial test method 208–210
 challenge testing 208–209
 microbial transmission test 209–210
 zone of inhibition 208
 clinical efficacy of 212
 local and systemic toxicity of 211–212
 silver ions from 204–205
 wound dressings 195
 absorption capacities 202–203
 Acticoat-Smith and Nephew 199

Actisorb silver 220–Johnson and

Johnson 200

antimicrobial effect 205

Aquacel Ag-ConvaTec 200

contact areas 202

Contreet foam-Coloplast 200

Microbian-Lendell Manufacturing Inc 201

SilvaSorb-Medline 200

Silvercel-Johnson & Johnson 199

silver compounds 197–198

silver compounds types 201–202

Silverlon-Argentum Medical 200

silver method 198–199

silver-releasing dressings 206–208

silver wound healing 206–208

through blending 203

through chemical reaction 203

Urgotul SSD-Laboratoires Urgo 200

silver containing wound dressings

list of 217–220

silver ions 71–73, 116–117, 163, 193–195, 197–207, 230

silver novel alginate fibers 73–76

silver sulfadiazine (SSD) 72, 196, 200, 201, 210–212

sloughy wounds 104, 111

sodium alginate 23, 171

 and calcium alginate 221

 fibers 57, 65–68, 83, 91, 93, 98, 118, 142, 148

sodium ions 65–66, 69–70, 83–84, 86–87, 92, 94–95, 97–99, 118, 125, 128, 130, 133, 137, 155, 160, 163, 205, 222

Sorbsan 84, 86–87, 96–97, 120, 125, 126, 131–132, 134–139, 148–151, 155–156

Spirogyra 195

Staphylococcus aureus 91, 116, 146, 194, 196

sulfated alginate 172

superabsorbent cellulosic fibers 108–109

superficial wounds 77, 104, 223

t

tetrabutylammonium (TBA) 174–176

tetrabutylammonium fluoride (TBAF) 175

tetrabutylammonium hydroxide (TBA-OH) 174

textile printing paste 48

therapeutic cell entrapment 45

thickening agent 27, 39, 48

TIMP-1 140–141

tissue-engineered skin equivalent 117

- tissue inhibitors of matrix
metalloproteinases (TIMPs)
140–141
- traditional dressings 106, 231
- tri-sodium citrate 84–85, 96
- tumor necrosis factor- α (TNF- α) 35, 117,
139, 146, 206
- Turbinaria* 4–5
- U**
- ultrapure alginate 14–15
- V**
- vancomycin-resistant *Enterococci* (VRE)
116
- viscosity solution
concentration effect 27–28
molecular weight on 26–27
pH effect 29
salt effect 28–29
share rate effect 28
temperature effect 28
- W**
- water soluble alginates 49–50
- water soluble polymer 19, 57, 70, 110, 178,
185
- wet integrity test 127
- wicking behavior test 127
- wound dressings 46, 101
activated carbon 112–113
alginate fibers 118–119
Acticoat-Smith and Nephew 199
Actisorb silver 220-Johnson and
Johnson 200
Aquacel Ag-ConvaTec 200
Contretec foam-Coloplast 200
Microbisan-Lendell Manufacturing Inc
201
- SilvaSorb-Medline 200
- Silvercel-Johnson & Johnson 199
- silver compounds 197–198
- Silverlon-Argentum Medical 200
- silver method 198–199
- Urgotul SSD-Laboratoires Urgo 200
- alginate wound dressings 119
- antimicrobial 116–117
- cell-containing matrices 117
- chitin and chitosan fibers 107–108
- composite wound care products
114–115
- contact and functional layers 115
- five types of 104
- functional and retention layers 115
- functional requirements of 103–106
- functions of 105
- hydrocolloids 111–112
- hydrogels 110–111
- interactive dressings 117
- low adherent dressings 113–114
- modern dressings 106–107
- modern semi-permeable film dressings
109
- nonwoven fabrics 119
- polyurethane film and foam 109–110
- is Promogran 117
- superabsorbent cellulosic fibers
108–109
- tissue-engineered skin equivalent 117
- wounds, defined 101
- X**
- X-Static fibers 116, 199
- Z**
- zinc alginate fibers 62, 69, 87, 89–92, 98
- zinc ions 69, 87–91, 98, 141, 155
- zone of inhibition 91, 196, 208, 210