

Index

- AC, *see* activated carbon
- acid hydrolysis 74–7, 79
- activated carbon (AC) 3, 62–9,
71–4, 119, 150, 222, 224,
238
- adsorbate 64, 72, 111–12, 119
- adsorbent materials 69, 71
- adsorption 10, 66, 69, 110–12,
119
- adsorption capacities 9–10, 73–4,
152, 154
- AFM, *see* atomic force microscopy
- agricultural wastes 2, 68–70
- amorphous cellulose 76
- anatase 98, 153–4, 248–51,
253–6, 261
- anode 176–7, 179–80
- anode materials 178–9, 181, 183
- antibacterial properties 136, 145,
153, 155–6
- antimicrobial activity 222–5, 227,
237, 239, 241–2
- antimicrobial applications 223–5
- antimicrobial properties 144–5
- antimony 179–80
- aquatic environment 148, 221,
223
- aqueous solutions 4, 10, 31, 38–9,
64, 67, 69, 72–3, 98, 111,
115, 136, 169, 197, 202
- arsenic 2, 97–8, 149–50, 155
- arsenic removal 98, 149
- atomic force microscopy (AFM)
134–5, 207
- bentonite 4, 6, 8, 65, 99, 110,
112–15
- bentonite clay 110, 112
- biodegradable nanocomposites
125, 137
- biofibers 57
- biological metabolism of
wastewater 62
- biopolymers 3, 14, 25, 57, 67
- biosorption 69
- brookite 248–9
- bulk polymerization 129
- carbon 48–9, 52, 54, 66–7, 152,
193, 263
- carbon nanoparticles 64, 200
- carbon nanotubes 64, 79, 193,
196, 201, 223
- catalysts 172, 178, 196, 199, 223,
255, 259–60, 262, 264–5
- CCD, *see* cold corona discharge
- cell wall 50–1, 54, 75, 78
- cellulose 3, 29, 36, 48–50, 54–7,
69, 73–9, 193, 199, 201
microcrystalline 78–9
microfibrillated 77–9
nanocrystalline 47, 75, 77, 80
- cellulose chains 54, 74–5
- cellulose content 48, 55
- cellulose fibers 56, 74, 76–7
- cellulose material 48, 75, 78
- cellulose microfibrils 50, 76, 78–9
- cellulose nanocomposite materials
73
- cellulose nanocomposites 73
- cellulose nanocrystals 73, 75,
77–9
- cellulose nanofibers 48, 73, 76
- cellulose nanoparticles 77–8, 80

- cellulose nanowhiskers 47, 77–8
- cellulosic materials 75
- cellulosic nanocomposites 47–8, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76
- cellulosic nanocomposites for treatment of wastewater 47–8, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76
- ceramic materials 196
- chemical contaminations 38, 144, 146
- chemical oxidative polymerization 39, 225–6
- chemical vapor deposition techniques 148, 154
- chemisorption 109, 211–12
- chitosan 1–8, 10–14, 25, 34, 64, 67, 148, 223
- chitosan-based polymer nanocomposites 1, 4–5, 7, 9
- chitosan-based polymer nanocomposites for heavy metal removal 2, 4, 6, 8, 10, 12, 14
- chitosan-capped gold nanocomposite 8
- chitosan clay nanocomposite 4
- chitosan-coated fly ash 6, 8
- chitosan nanocomposite 4
 - graphene oxide 12
- chitosan nanoparticles 4
- chitosan– magnetite nanocomposites 5
- chitosan–clay nanocomposite 4
- chromium 2, 58, 73, 97, 201
- chromium removal 73, 201
- clay-based nanocomposites 98
- clay layers 102
- clay minerals 98–9, 110
- clay particles 98–9, 104–5, 108–10, 114, 119, 128
- clean water 118, 127, 143–4, 222
- coacervation process, complex 38
- coconut shell 67, 69, 71–2
- cold corona discharge (CCD) 174–5
- coliform bacteria 223, 230, 237–8
 - fecal 221–3
 - isolating 222, 225, 228
- coliforms 228, 230, 242
- color removal 169, 184–5
- composite materials 49, 51, 73, 192, 209
 - properties of 77, 192
- composites 5–8, 47–9, 52–3, 75, 98, 104, 112–13, 119, 126, 128, 137, 192–3, 196, 214, 232
 - natural fiber 53
 - reinforced 49
- conjugated polymers 225
- conventional nanocomposites 128
- conventional wastewater treatment 58
- copper 2, 58, 98
 - removal of 12
- core-shell nanocomposites 212, 214
- corona discharge method 174, 176
- cotton 48, 52, 54, 74–5, 78
- DBPs, *see* disinfection by-products
- dendrimers 134
- dimensionally stable anode (DSA) 179
- dimensions, crystallite 254–6
- diphenhydramine 248, 250
- disinfection by-products 223
- disinfection by-products (DBPs) 144–5, 223

- dissolved ozone 183
drinking water quality 208
DSA, *see* dimensionally stable anode
dye-containing wastewater 155
dye removal 63, 69
- electrochemical ozone production (EOP) 167–8, 170, 172, 174, 176, 178–80, 182, 184
electrode materials 178–9
electrospinning 129–30
EOP, *see* electrochemical ozone production
Escherichia coli 135, 147, 221, 223
ethanol 197–8, 200, 233, 250, 252
ethylene vinyl acetate (EVA) 103, 110, 112–15
EVA, *see* ethylene vinyl acetate
EVA-bentonite nanocomposites 97–8, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118
- fiber sources 51
fibers 48–57, 75–7, 79–80, 119, 126, 199, 225, 234, 240
cellulosic 48–9, 80
mineral 48
nanocomposite-based 243
flocculation 59, 61, 63, 144, 208
food industry 25, 29
- gold 179, 200, 203, 209, 211, 249, 256, 260, 264–5
graft copolymerization 26, 30–1, 36, 39, 80
graphene oxide–chitosan nanocomposite 9
graphene polypyrrole nanocomposite 137
- groundwater 149, 208
contaminated 149
guar gum 25, 30–1
gum arabic 26, 33
gum gellan 29–30
gum ghatti 32–3
gum karaya 26–7
gum-polysaccharide-based nanocomposites 23–4, 26, 28, 30, 32, 34, 36, 38, 40
gum polysaccharides 25, 29, 31
gum xanthan 25, 28–9
- Hammett constant 263–5
heavy metal, detection 191–2
heavy metal adsorption 4, 13–14, 109, 191
heavy metal ions 2, 4, 23, 38–9, 150, 191, 201–2, 210–12, 214
detection 210–11
heavy metal removal 1–2, 4, 6, 8–14, 97–8, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118
heavy metals 2, 4, 58, 67, 69, 97–8, 100, 108–10, 114–16, 118–19, 147, 149–51, 153–4, 156, 191
hemicelluloses 48, 50–1, 54–7, 69, 74–6
hexavalent chromium 4
high resolution transmission electron microscopy (HRTEM) 236, 242, 252, 256
HRTEM, *see* high resolution transmission electron microscopy
hydrogen peroxide 168, 170, 172
hydrophilic polymers 99

- hydrophobicity 134, 136
- hydroxyl radicals 171–2
- industrial effluents 23–4, 26, 28, 30, 32, 34, 36, 38–40, 109, 125, 128, 135, 137
- inorganic compounds 58, 169–71
- intercalated nanocomposites 106–8, 128, 194
- intercalation 101–4, 130
- intraparticle diffusion 111–12
- ion exchange 2, 12, 59, 63–4, 98–9, 109, 208
- ions
 - exchangeable 99–100
 - heavy-metal 111
 - toxic 64, 210–11
- Langmuir isotherm 9–10
- LCST, *see* lower critical solution temperature
- liquid phase reductive deposition (LPRD) 251, 256–61, 264–5
- localized surface plasmon resonance (LSPR) 209
- locust bean gum 31
- low-cost adsorbents 3, 14, 64–5
- lower critical solution temperature (LCST) 34, 38
- LPRD, *see* liquid phase reductive deposition
- LSPR, *see* localized surface plasmon resonance
- magnetic chitosan 4–5
- magnetic chitosan nanocomposites 12
- magnetic chitosan nanoparticles 5
- magnetic Fe 150–1
- magnetic graphene nanocomposites 202
- magnetic nanoparticles 150, 152, 197
 - synthesis of 151
- magnetic particles 152
- matrix materials 56–7
- MCMs, *see* Mobil crystalline materials
- melt-blending method 101, 103, 110, 112, 115–16, 118–19
- melt intercalation 103
- membrane filtration method 222, 225, 227–9
- membrane separations 61, 63
- membranes, nanocomposite-based 222, 227, 242
- metal electroplating wastewaters 136
- metal ions 3–4, 9–10, 12, 14, 39, 66–7, 135, 147, 151, 192, 201, 208–9, 214
- metal nanoparticles 2, 4, 12, 209–10, 224
- methylene blue 71, 128
- microbial contaminations 144
- microfibrils 50, 57, 74–6, 78
- microorganisms 14, 25, 28–9, 59, 62, 171, 224
- Mobil crystalline materials (MCMs) 199
- nanocomposite applications 77
- nanocomposite brittleness 118
- nanocomposite materials 75, 126, 132, 134, 167
 - functional 1
 - hybrid 193
- nanocomposite particles 111
- nanocomposites
 - biopolymer-based 24–5
 - chitosan-based 1, 5, 12–14, 38
 - chitosan–magnetite 4
 - core-shell 191, 201–2, 206, 213

- exfoliated 105, 107, 128–9, 194
- glucomannan–chitosan-based 38
- hydroxyapatite/chitosan 12
- modified chitosan–montmorillonite 4
- nylon 6–clay 102
- pH-Responsive 35–6
- polymer–clay 98, 116
- polypropylene–clay 108
- polysaccharide-based 24, 36, 38–9
- stimuli-responsive 33, 35
- synthesized 36
- temperature-responsive 33–4
- thermo-sensitive 34
- nanofillers 193, 195–7
- nanomaterials
 - carbonaceous 134, 136
 - natural 198–9
 - synthetic 198–9
- nanoparticles, magnetite 4, 10–12
- nanoparticles for water
 - purification 143–56
- natural fiber surfaces 49
- natural fibers 47–55, 57, 69
- natural polysaccharides 24
- natural waters 223, 250

- OER, *see* oxygen evolution reaction
- organic compounds 38, 47, 61–2, 172, 184, 201
- organic modifier 101–3
- organic pollutants 67, 144, 149–50, 152–3, 167–8, 170, 172, 174, 176, 178, 180, 182, 184
- organic wastewater 131
- organoclay 99–100, 104–5, 125
- organoclay nanocomposites 132
- oxidants 168–9, 172, 184, 226

- oxygen evolution reaction (OER) 178–9
- ozonation 59, 144, 169–73, 184
- ozone 144, 168–76, 178–80, 183–5, 223
 - molecular 169–70
- ozone concentrations 174, 183–4
- ozone decomposition 170–2
- ozone generation, electrochemical 176, 178
- ozone production 167, 173–5, 177–9
- ozone water 172–3, 178

- PCNs, *see* polymer–clay nanocomposites
- pectin 48, 51, 54–5, 57, 74
- PEM, *see* polymer electrolyte membrane
- perchlorate removal 127–8
- perchlorates 125, 127–8
- pesticides 58, 68, 147–8, 152, 155
- phenolic compounds 248, 250, 253, 261–3, 265
- phenols, substituted 250, 263–5
- plant fibers 51, 53–4, 71, 74
- platelets 99, 104, 108, 128–9
- polyacids 35
- polyaniline nanocomposites 125, 127
- polymer chains 24, 31, 33, 35, 101–2, 128–9, 194
- polymer coacervation process 37
- polymer electrolyte membrane (PEM) 176, 178
- polymer nanocomposites 14, 125–6, 128–30, 132–6, 224, 227
- polymer–clay nanocomposites (PCNs) 98–9, 103–5, 108–17

- polymeric nanocomposites 98–9, 101, 103, 105, 107, 118
- polymers, synthetic 25, 36, 40, 57
- polysaccharides 25, 31, 39–40, 55, 69, 147, 199
- polyurethane 114–15
- PPY-Ag nanocomposites 226–8, 230–8, 241–2

- QDs, *see* quantum dots
- quantum dots (QDs) 199, 202

- radical scavengers 171–2, 260
- reverse osmosis 2, 62, 64, 134
- rutile 248–51, 253–6, 261

- scanning electron microscope (SEM) 10, 108, 133, 180, 182, 185, 191, 206, 222, 225, 242
- scanning electron microscopy 133, 180, 206, 222, 225
- scanning probe characterization technique 206–7
- SEM, *see* scanning electron microscope
- silica 69, 195, 201, 203–4
- silica particles 197, 203
- silicate layers 107, 194
- silicates 105–6, 108, 110
- silver nanocomposites 211
 - oil-based polymer 132
- silver nanoparticle
 - nanocomposites 148
- silver nanoparticles 145–8, 156, 200, 203, 224–6, 230–4, 236–42
 - synthesis of 145–7
- SiO₂ nanoparticles 197
- smart nanocomposites 208–9, 211, 213
- smectite clay 99

- sodium borohydride 145, 148, 200
- sulfate removal 137
- sulfates 64, 125, 127, 148, 150
- sulfide 127, 169
- surface plasmon resonance 203–4
- suspension polymerization 37

- TEM, *see* transmission electron microscopy
- transmission electron microscopy (TEM) 105, 108, 132, 134–5, 191, 206–7, 222, 225, 236, 252

- UV-visible spectral studies 11–12

- wastewater
 - contaminated 170
 - decolorizing dyestuff 184
 - domestic 58
 - electroplating 73
 - industrial 58, 64, 67, 250
 - reclamation of 127
 - synthetic 72
- wastewater contaminant 127
- wastewater handling 48, 68
- wastewater reclamation 127
- wastewater treatment
 - large-scale 151
 - organic 131
- wastewater treatment adsorbents 65

- water
 - contaminated 38, 98, 144, 149, 153, 170, 222–3
 - contamination of 221, 223
 - deionized 4, 197
- water disinfection 148, 224
- water pollution 23, 151, 191
- water purification 68, 134, 143–56, 191, 223, 249

waterborne diseases 143–4, 222
wood fibers 48, 75–6

X-ray diffraction (XRD) 105–6,
108, 129–31, 180, 231,
242, 251, 256

xanthan gum 36
XRD, *see* X-ray diffraction

zeolites 64, 134–5, 194, 199
zero-valent iron 144, 148–50, 156
zinc 58, 72, 210

