

Index

a

- Activator Regenerated by Electron Transfer ATRP (ARGET-ATRP) 217
 - adhesive hydrophobic surfaces 6
 - adhesive surfaces 13
 - adsorptive ultrafiltration 148
 - advancing contact angle 2
 - alcohol biosensor 245
 - alcohol detection 230
 - ambient parameters 54
 - amino acids 234
 - aminopropyl trimethoxysilane (APTMS) 168
 - ammonia synthesis 253
 - amperometric detection, of hydrogen peroxide 230
 - amperometric electrochemical biosensor 231
 - anodic aluminum oxide (AAO) 14
 - antimicrobial application
 - nanocellulose 218
 - nanochitin 220
 - antifouling surfaces 13
 - anti-reflective surfaces 10
 - apoenzyme 235
 - atomic layer deposition (ALD) 46
 - atom transfer radical polymerization (ATRP) 41
 - ATR-FTIR spectroscopy 75
- ### b
- bacterial cellulose (BC) 211, 213
 - Beer-Lambert Law 74, 75
 - benzophenone (BP) 126
 - biocompatibility, nanocellulose 213, 215
 - biodegradability, nanocellulose 212, 215
 - bioluminescence 11
 - biomedical applications
 - LB films 196
 - nanocellulose 215, 217
 - biomimicry
 - adhesive hydrophobic surfaces 6
 - adhesive surfaces 13
 - anti-reflective surfaces 10
 - definition 1
 - drag reduction and antifouling surfaces 13
 - fog harvesting surfaces 9
 - innovation 2
 - self-cleaning surfaces 2
 - structural color 11
 - unidirectionally superhydrophobic surfaces 7
 - biopolymer 209
 - chemistry and ultrastructure 210
 - bioreceptors 227, 230
 - biosensor 228
 - advantages of 227
 - application 246
 - bioreceptor 230
 - conductometric 231
 - electrochemical 231, 232
 - enzyme based 227
 - historical perspectives 229
 - LB films 195
 - optical 232, 233

- biosensor (*contd.*)
 - parts 230
 - piezoelectric 233
 - potentiometric 231, 232
 - thermal 230
 - transducer 230
 - working principle of 230
- biphenyl tetraacyl chloride (BTEC) 144
- blending
 - polymer-inorganic blending 117
 - polymer-polymer blending 116
- brackish water desalination 142
- branching reaction 261
- bright-field TEM 90
- Brunauer, Emmett and Teller (BET) analysis 102, 277
- C**
- calixaren 246
- carbon molecular sieve (CMS) 162
- carbonaceous-materials 273
- Carcharhinus brachyurus 13
- Cassie impregnating wetting regime 6
- Cassie model 6
- casting method 5
- catalysis 255
 - advances in 255
 - category 256, 257
 - chain reactions 260
 - chain transfer reactions 261
 - CVD process 269
 - economical aspects of 254
 - enzymatic reactions 262
 - gelation method 266
 - history of 253
 - heterogeneous reaction 258, 263
 - homogeneous vs. heterogeneous 256
 - impregnation 268
 - industrial aspects of 254
 - ion exchange method 270
 - microscopic reversibility principle 260
 - precipitation 265
 - preparation 265
 - rate laws 259
 - rates of reaction 258
 - reaction mechanisms 259
 - rule of simplicity 260
 - solvothermal treatments 269
- cellulose 209, *see also* nanocellulose
 - chemical structures of 210
- cellulose nanocrystals (CNC) 210, 212, 213, 219
 - cytotoxicity 213
 - in electrospun composite scaffolds 213
 - FA-grafted synthesis 216
 - surface charge effect 215
- cellulose nanofibrils (CNF) 217, 219
 - cytotoxicity 213, 217
- chain reactions 260
- chain transfer reaction mechanism 261
- chemical color 11
- chemical grafting process 220
- chemical industry 256
 - growth rate 255
- chemical shift 80
- chemical vapor deposition (CVD) 31
 - advantages 30
 - applications 29
 - boron carbide 34
 - cold wall CVD reactor 32
 - conventional/thermal CVD 37
 - fundamental aspects 34
 - hot wall CVD reactor 32
 - hot-wire CVD 40
 - kinetics 36
 - limitations 30
 - low-pressure CVD 38
 - plasma enhanced CVD 38
 - polymeric thin films
 - initiated CVD 42
 - plasma polymerization 40
 - principles of 33
 - production methods 29
 - reactors 31
 - roll-to roll atmospheric pressure 33
 - solution phase methods 31
 - thermodynamics 35

- chemical vapor deposition (CVD)
 process 269
- chitin 209, *see also* nanochitin
 chemical structures of 210
- chronoamperometry 231
- closed cell liquid AFM 98
- CNC-fluorescein isothiocyanate (FITC)
 215, 216
- CNC-rhodamine B isothiocyanate
 (RBITC) 215, 216
- coaxial electrospinning method 55
- competitive inhibition 262
- conductometric biosensors 231
- contact angle 2, 5, 101
- contact angle hysteresis 102
- contact mode AFM 97
- conventional CVD 37
- covalent bonds, enzyme immobilization
 243
- cross-linking method, enzyme
 immobilization 245
- Cryo-TEM 92
- CVD, *see* chemical vapor deposition
 (CVD)
- Cytotoxicity, nanocellulose 213
- d**
- dark-field TEM 90
- DC diode sputtering 28
- dense membrane, for gas separation
 process 153
- desalination 142
- dialdehyde bacterial nanocellulose
 (DBC) 217
- diallyl dimethyl ammonium chloride
 (DADMAC) 139
- 3,5-diamino-N-(4-aminophenyl)
 benzamide (DABA) 145
- Diffuse Reflectance Infrared Fourier
 Transform Spectroscopy
 (DRIFTS) 277
- dip coating 59
- drag reduction 13
- drinking water production
 adsorptive ultrafiltration 148
 reverse osmosis and forward
 osmosis 142
- e**
- e-beam deposition 26
- electropolymerized polymer film 247
- electrochemical biosensors 231, 232
- electroless plating 58
- electrolytic anodization 56
 anodising 57
 colouring 57
 sealing 57
- electron diffraction (ED) 91
- electron energy loss spectroscopy
 (EELS) 92
- electron microscopes
 depth of field 83
 ESEM 87
 magnified image 83
 resolution 83
 scanning electron microscope 84
 TEM 89
- electrophoretic deposition (EPD) 59
- electroplating 57
 cleaning 57
 plating 58
 stripping 58
- electrospinning 52
 coaxial electrospinning method 55
 collection screen 54
 concentration 53
 electric potential 53
 emulsion electrospinning 55
 flow rate 53
 melt electrospinning 55
 molecular weight 53
 needle gauge 54
 solution viscosity 53
- electrospun nanofibers 143
- electrostatic force microscope (EFM)
 100
- elementary reactions 259
- Eley-Rideal mechanism 264
- emulsion electrospinning 55
- encapsulation, enzyme immobilization
 244
- energy-dispersive X-ray spectroscopy
 (EDX) 91
- entrapment, enzyme immobilization
 243

- environmental scanning electron microscopy (ESEM) 87
- enzyme
 - amino acids 234
 - based biosensors 227, 245
 - catalysis 262
 - covalent binding 243
 - cross-linking method 245
 - encapsulation 244
 - entrapment 243
 - immobilization 240
 - induced fit model 235
 - lock and key model 235
 - physical adsorption 242
 - sensor 229
- Enzyme Commission Numbers 235
- ESEM, *see* environmental scanning electron microscopy (ESEM)
- evaporation 25
- f**
 - fatty acid salts, LB films 189
 - Field-Effect Transistors (FETs) 191, 192
 - fluorescein isothiocyanate (FITC) 216
 - fluorinated polyimide 6
 - fog hartvesting surfaces 9
 - food industry, enzyme based biosensors 245
 - forward osmosis (FO) process 133, 142
 - Fourier transform infrared (FTIR) spectroscopy 72, 277
 - advantages and disadvantages 76
 - applications of 77
 - methods and sampling techniques 74
 - Michelson interferometer 73
 - surface characterization with 72
 - free radical polymerization reactions 261
 - FTIR spectroscopy, *see* Fourier transform infrared (FTIR) spectroscopy
- g**
 - gas sensors, LB films 190, 193
 - gas separation process 153
 - gelation method 266
 - Gibb's free energy 35, 36
 - glow-discharge PECVD 39, 40
 - glucose analyzer 230
 - glucose oxidase, entrapment of 244
 - grafting polymers 275
- h**
 - Haber-Bosch process 253
 - heat treatment 127
 - heterogeneous catalysis reaction 253, 257, 258, 263
 - high-angle annular dark-field STEM (HAADF-STEM) 91
 - high-resolution TEM (HRTEM) 91
 - homogeneous catalysis 256
 - hot-wire CVD (HWCVD) 40
 - hydrogel 267
 - hydrogen peroxide, amperometric detection 230
 - hydrolases, enzyme 238
 - hydrophilic 101
 - hydrophobic surfaces, adhesive 6
 - hydrophobicity 140
 - hydrous ferric oxide (HFO) 152
- i**
 - immobilized enzymes 240
 - covalent binding 243
 - cross-linking method 245
 - encapsulation 244
 - entrapment 243
 - physical adsorption 242
 - immunosensor, LB films 195, 196
 - impregnation method 268
 - induced fit model, enzyme 235
 - inductively coupled plasma (ICP) 277
 - infrared (IR) spectroscopy 72
 - inhibitor 262
 - competitive 262
 - non-competitive 263
 - substrate 263
 - initiated PECVD (iPECVD) 41, 42
 - interfacial polymerization (IP) 118
 - intermittent contact mode AFM 98
 - International Union of Biochemistry and Molecular Biology 235

- ion exchange method 270
 ion plating 28
 IR beam 75
 isomerases, enzyme 239
 isotherm hysteresis 186
- k**
- KBr-pellet 75
 kinetics 36
- l**
- lab-on-a-chip (LOC) system 230
 laccase immobilization 243
 Langmuir-Blodgett (LB) films 181, 182, 187, 190
 applications 183, 187
 biomedical applications 196
 biosensors 195
 comparative strengths and weaknesses 183
 deposition methods 184
 fatty acid salts 189
 FETs 191, 192
 gas sensors 190, 193
 immunosensor 195, 196
 isotherm hysteresis 186
 vs. LbL films 197
 monolayer stability 184–186
 nanoparticles 188
 nanopatterning using 188
 sensors 189, 190, 193, 195
 SPR sensors 191
 technology 183
 use of 187
 Langmuir-Hinshelwood mechanism 263
 Larmor frequency 80
 lateral force microscope (LFM) 100
 layer-by-layer (LBL) assembly method 119
 layer-by-layer (LbL) films 181–183, 187
 biomedical applications 196
 comparative strengths and weaknesses 183
 development and rapid proliferation 183
 vs. LB films 197
 LB films, *see* Langmuir-Blodgett (LB) films
 ligases, enzyme 239
 linear chain reaction 261
 lithography 8
 lock and key model, enzyme 235
 lotus effect 3, 7
 low pressure CVD (LPCVD) systems 31, 38
 lyases, enzyme 238
- m**
- magnetic force microscope (MFM) 100
 magnetron sputtering 28
 melt electrospinning method 55
 membrane 115
 membrane distillation 134
 membrane surface modification
 blending
 polymer-inorganic blending 117
 polymer-polymer blending 116
 chemical process 127
 dense membrane for gas separation process 153
 drinking water production
 adsorptive ultrafiltration 148
 reverse osmosis and forward osmosis 142
 heat treatment 127
 molecular imprinting technology 127
 photo-initiated polymerization
 UV-initiated grafting-from membrane surface 125
 UV-initiated grafting-to membrane surface 124
 solvent resistant nanofiltration membrane 164
 surface coating
 advantages and disadvantages 122
 interfacial polymerization 118
 layer-by-layer coating 119
 sol-gel coating 120
 spin coating 123
 wastewater treatment

- membrane surface modification (*contd.*)
 - nanofiltration & membrane distillation 134
 - ultrafiltration and forward osmosis 128
 - metal oxides 266, 268, 269, 274
 - nanoparticle 276
 - metal-free phthalocyanine 186
 - metal-organic chemical vapor deposition (MOCVD) 269
 - metal-organic framework (MOF) 159, 163
 - micelles, enzyme encapsulation in 245
 - Michaelis-Menten kinetics 262
 - Michelson interferometer 73
 - microcrystalline cellulose (MCC) 213
 - microfibrillated cellulose (MFC) 217, 219
 - microfibrils 210, 211
 - microscopic reversibility principle, catalysis 260
 - molecular imprinting technology (MIT) 127
 - monolayer stability, LB films 184–186
- n**
- nanocellulose 209
 - antimicrobial application 218
 - applications 217
 - biocompatibility 213, 215
 - biodegradability 212, 215
 - biomedical application 215, 217
 - functional surface modification 214
 - low cytotoxicity 213
 - nanochitin 209, 211, 214
 - antimicrobial application 220
 - functional surface modification 214
 - nanofiltration 134
 - nanindentation measures 100
 - nanoparticles, LB films 188
 - nitrogen adsorption-desorption analysis 277
 - NMR, *see* nuclear magnetic resonance spectroscopy
 - non-competitive inhibition 263
 - non-contact mode AFM 98
 - nuclear magnetic resonance spectroscopy (NMR) 80
 - applications of 83
 - Carbon-13 NMR 81
 - continuous wave NMR 81
 - Fourier transform NMR 81
 - gas state NMR 82
 - ¹H-NMR 81
 - instrumentation and sample handling 82
 - one dimensional NMR 82
 - solid state NMR 81
 - solution state NMR 82
 - theory of 80
 - two-dimensional NMR 82
 - types of 81
 - nuclear shielding 80
- o**
- Occam's razor 260
 - oily wastewater 128
 - Optical biosensors 232, 233
 - organic solvent application, solvent resistant nanofiltration membrane for 164
 - oxidoreductases, enzyme 237
- p**
- pentafluoroethane (PFE) films 7
 - perfluoroalkyl ethyl methacrylate (PPFEMA) 5
 - petal effect 6, 7, 15
 - photo-initiated polymerization
 - UV-initiated grafting-from membrane surface 125
 - UV-initiated grafting-to membrane surface 124
 - photo-initiator 126
 - photoelectric effect 71
 - phthalocyanines 190
 - physical color, *see* structural color
 - physical vapor deposition (PVD) 24, 195
 - advantages 24
 - drawbacks 25
 - e-beam deposition 26
 - evaporation 25

- ion plating 28
 - reactive evaporation 27
 - sputter deposition 27
 - types 25
 - piezoelectric biosensor 233
 - Planck constant 73
 - plasma treatment 5
 - plasma-enhanced CVD (PECVD) 38, 40
 - poly (phthalazinone ether sulfone ketone) (PPESK) 140
 - poly (sodium 4-styrene-sulfonate) (PSS) 147
 - poly vinyl alcohol (PVA) solution 6
 - poly(amide-b-ether) block copolymer (PEBAX) 155, 160, 161
 - poly(arylsulfone) (PAS) membranes 125
 - poly(caprolactone) (PCL) fibers 5
 - poly(ether-block-amide) 160
 - poly(ethylene glycol) (PEG) 116, 155
 - poly(ethylene oxide) (PEO) 155
 - poly-D-lysine (PDL) 218
 - polydimethylsiloxane (PDMS) 5, 159
 - polyelectrolytes 182
 - polymer (poly(*N,N*-dimethylaminoethyl methacrylate) (PDMAEMA) 159
 - polymer solution concentration 8
 - polymer-inorganic blending 117
 - polymer-polymer blending 116
 - polymeric additive 116
 - polymeric thin films
 - initiated CVD 42
 - plasma polymerization 40
 - polypyrrole (PPy) 78
 - polyvinylpyrrolidone (PVP) 116
 - porphyrins 190
 - potentiometric biosensors 231, 232
 - pressure retarded osmosis (PRO) mode 134
 - products 262
 - pseudo steady state hypothesis (PSSH) 260
 - PVD, *see* physical vapor deposition (PVD)
- q**
- Quartz Crystal Microbalance (QCM) 187
 - quasi-stationary state situation (QSS) 260
- r**
- radio-frequency (RF) sputtering 27
 - rate controlling/determining step 260
 - rate limiting step 260
 - reaction mechanisms, catalysis 259
 - reactive evaporation 27
 - receding contact angle 102
 - response time 233
 - reverse osmosis 142
- s**
- scanning electron microscope (SEM) 84, 276
 - of dried Chitosan nanoparticles 90
 - of dried hydrogel sample 89
 - lotus leaf surface 4
 - sample preparation 86
 - vacuum types 88
 - scanning probe microscopy (SPM)
 - closed cell liquid AFM 98
 - contact mode AFM 97
 - electrostatic force microscope 100
 - intermittent contact mode AFM 98
 - lateral force microscope 100
 - magnetic force microscope 100
 - nanoindentation 100
 - non-contact mode AFM 98
 - operating modes 97
 - scanning tunneling microscope 98
 - working principle 96
 - scanning transmission electron microscope (STEM) 84, 91
 - scanning tunneling microscope (STM) 98
 - seawater desalination 142
 - self-assembled monolayers (SAMs) 187
 - self-cleaning surfaces 2
 - sensors, LB films 189, 190, 193, 195
 - sharkskin 13, 14
 - silica nanoparticles 275

- sliding angle 2
 - sol-gel coating 48, 120, 266
 - coatings 52
 - drying and aging 51
 - pH effect 49
 - precursors 50
 - temperature 51
 - solid catalysts, preparation of 265
 - solid surface
 - characterization technique 276
 - modification technique 271
 - soluble catalysts 257
 - solution viscosity 124
 - solvent resistant nanofiltration (SRNF) 164
 - solvothermal process 269
 - spin coating 41, 123
 - sputter deposition 27
 - Stenocara sp 9
 - structural color 11
 - substrate inhibition 263
 - substrates 262
 - sulfonated poly(ether ether ketone) (SPEEK) 137
 - sulfonated polyphenylenesulfone (sPPSU) 138
 - superhydrophobic surfaces 7, 101
 - surface chemistry, historical development of 254
 - surface coating
 - interfacial polymerization 118
 - layer-by-layer coating 119
 - sol-gel coating 120
 - spin coating 123
 - surface grafting 132
 - surface modification 23
 - surface plasmon resonance (SPR) sensors 191
 - surface science, history of 253
- t**
- TEM, *see* transmission electron microscope (TEM)
 - temperature-programmed desorption (TPD) 276, 277
 - Terahertz time domain spectroscopy (THz-TDS) 104
- Tetramethylsilane (TMS) 81
 - textile wastewater 134
 - thermal biosensors 230
 - thermal CVD 37
 - thermodynamics 35
 - thin film nanocomposite (TFN) membranes 169
 - thin organic films 181
 - LB film, *see* Langmuir-Blodgett (LB) films
 - LbL film, *see* Layer-by-layer (LbL) films
 - production methods 181
 - types 181, 182
 - titration method 277
 - transducer, working principle 230
 - transferase enzyme 238
 - transmission electron microscope (TEM) 89, 276
 - bright-field TEM 90
 - dark-field TEM 90
 - 3D-TEM 92
 - Cryo-TEM 92
 - EDX 91
 - EELS 92
 - electron diffraction 91
 - HAADF-STEM 91
 - high-resolution TEM 91
 - sample preparation 93
 - STEM 91
 - trimethylammonium (TMA) 46
 - trimethylene tetramine (TETA) 159
- u**
- ultrafiltration membrane 128
 - underground water purification 148
 - UV-initiated grafting-from membrane surface 125
 - UV-initiated grafting-to membrane surface 124
- v**
- vapor deposition processes 23
 - atomic layer deposition 46
 - classification 24
 - CVD
 - conventional/thermal CVD 37

- hot-wire CVD 40
- kinetics 36
- low-pressure CVD 38
- plasma enhanced CVD 38
- polymeric thin films 40
- principles of 33
- reactors 31
- thermodynamics 35
- PVD
 - advantages 24
 - drawbacks 25
 - e-beam deposition 26
 - evaporation 25
 - ion plating 28
 - reactive evaporation 27
 - sputter deposition 27
 - types 25
- vertically single-walled carbon nanotubes (VA-SWNTs) 14
- volatile organic chemicals (VOCs), LB films 190

- W**
- wastewater treatment
 - nanofiltration & membrane distillation 134
 - ultrafiltration and forward osmosis 128

- water hydrophobic 101
- Wenzel equation 4
- wet coating techniques
 - dip coating 59
 - electroless plating 58
 - electrolytic anodization 56
 - electrophoretic deposition 59
 - electroplating 57
 - electrospinning 52
 - sol-gel coating 48

- X**
- X-ray diffraction (XRD) 69, 276
- X-ray florescent spectroscopy 68
- X-ray photoelectron spectroscopy (XPS) 71, 276, 277
- X-ray spectroscopy techniques 67
 - X-ray diffraction 69
 - X-ray florescent spectroscopy 68
 - X-ray photoelectron spectroscopy 71

- Z**
- zein-pectin capsule 77
- zeolites 162, 269–271, 275
 - H-type of 275

