

Index

a

- adhesion behaviors
 - fibronectin (FN) adsorption 161
 - ice crystallization
 - anti-adhesion icing
 - properties 176–179
 - mechanism 174–176
 - influence factors 162
 - liquid-solid adhesion
 - artificial superhydrophobic surfaces 164–167
 - chemical composition and rough structures 167–168
 - external stimuli 168–173
 - natural superhydrophobic surfaces 162–164
 - low-adhesive superhydrophobic surfaces 161
 - solid-liquid adhesions 161
 - solid-solid adhesion 179–183
- aerosol assisted chemical vapor deposition (AACVD) 124
- 3-aminopropyltriethoxysilane (APTEOS) 95
- amorphous intra-cuticular wax 34
- animals, superhydrophobic properties in
 - chemical composition 34–38
 - Clam's shell 33–34
 - fish 31–33
 - mosquito eyes 33
 - shark skin 33
 - snails 33
 - springtail 31
- anisotropic adhesion 171
- anodization 92–93
- anti-fingerprint superhydrophobic film 18
- anti-fogging compound eyes 284
- anti-icing/anti-frosting 375
 - anti-icing materials and icephobic materials 285
- droplet impacting and bouncing 346–348
- icephobic performances, SHPSs 331–335
- elastomers 341
- levitation process 342
- polyelectrolyte matrix 340
- self-lubricating liquid water layer (SLLWL) 337–340
- SLIPs 336–337
- icephobic surfaces (IPs) 274
- jumping-droplet condensation 348–350
- SLIPs
 - droplet impact and condensation 326–328
 - lubricant and texture geometry 324
 - stable and defect-free lubricating interface 329
 - ultra-smooth and chemically homogeneous interface 329
- vs. superhydrophobic surface SHPSs
 - condensed water droplet 316–324
 - contact time minimization 312–313

- anti-icing/anti-frosting (*contd.*)
 - droplet rolling behavior 299–303
 - impact resistance
 - improvement 307–309
 - vs. impact water
 - droplets 309–312
 - oblique impact 313–316
 - sessile water droplets
 - freezing 303–307
 - surface wettability theories and models 343–345
 - traditional anti-icing/de-icing methods 273
 - water and ice adhesion, to solid surface 345–346
- antireflective (AR) coating 95
- assie model 25
- azobenzene 199, 200
- azo-polymer coatings 169
- b**
 - bacterial adhesions 181
 - 3-phenyl-3,4-dihydro-2H-benzooxazine-6-carbaldehyde (BA-CHO) 254
 - biomimetic superhydrophobic materials 374
 - anti-fingerprint superhydrophobic film 18
 - anti-icing/anti-frosting *see* anti-icing/anti-frosting
 - anti-icing property 18–20
 - cobalt magnetic particles (Co MPs) 3
 - corrosion resistance 9–13
 - fluid coating method 3
 - lotus's surface and design 40–42
 - nanoparticles 2
 - nylon fibers 3
 - petal surface structures and adhesion 43–45
 - photochromism 13–14
 - robust and durable superhydrophobic materials 15–16
 - salvinia like surface, with air retention 42–43
 - self-cleaning effect 6–9
 - TiO₂ 6
 - transparent and conductive superhydrophobic film 16–18
 - water harvesting 2–3
 - biomimetic superhydrophobic surfaces
 - hybrid materials 143–144
 - inorganic materials 130–138
 - organic materials
 - polymers 138–142
 - potential applications 144–146
 - self-cleaning and transparent properties 129
 - bionics 373
 - boron nitride (BN) films 138
 - butterfly's wings 296–298
- c**
 - carbon-silica sponge
 - regeneration 238
 - Cassie-Baxter model 64–65, 72–74, 179, 373
 - Cassie-Wenzel transition 75–76
 - cell adhesion 181
 - cetyltrimethoxysilane (CTMS) 95
 - chemical vapor deposition (CVD) 124–125
 - clam's shell 33
 - classical ice nucleation theories 277–279
 - cobalt magnetic particles (Co MPs) 3
 - contact angle and Young's equation
 - hydrophobicity 60
 - interfacial energy 60
 - contact angle hysteresis (CAH) 69–71
 - corrosion resistance 9–13
- d**
 - diarylethenes 200
 - direct reproduction 103
 - dry-style antifogging property 296
 - dual-responsive surface 214–217
- e**
 - electrodeposition 126–127
 - advantages 100
 - AZ91D magnesium alloy 100
 - Cu superhydrophobic coating 100

- EDOT heterocycle 100
- fluorine-doped tin oxide (FTO)
 - glass 98
- fluoropolymers 101
- Mie scattering effect 98
- Ni-Co alloy coating 100
- TO-modified surfaces 97
- zinc coating 98
- electrohydrodynamics (EHD)
 - method 38–39
- electrospinning deposition 255
- electrospinning process 126
- electro-wetting 210
- epicuticular waxes (EPW) 34, 37
- etching method
 - Ag nanoparticles 88
 - black silicon 88
 - copper 88
 - metal surface treatment 88
 - perfluorooctanoic acid (PFOA) 88
 - wet etching and dry etching 87
- external cutin layer (ECL) 34
- f**
- fabrications
 - superhydrophobic nanocoatings
 - chemical vapor deposition (CVD) 124–125
 - electrodeposition 126–127
 - electrospinning process 126
 - sol-gel process 123–124
 - solution immersion
 - process 127–128
 - spray process 125–126
 - superhydrophobic surfaces
 - anodization 92–93
 - direct reproduction 103–104
 - electrodeposition 97–101
 - etching method 87–89
 - hydrothermal method 101–102
 - laser processing 93–95
 - lithography 89–92
 - sol-gel process 95–97
- fabrication technologies 374
- fibronectin (FN) adsorption 161
- field emission scanning electron microscopy (FE-SEM) 27
- fish 31–33
- fluid coating method 3
- fluoroalkylsilane (FAS) 9, 237
- fluoropolymers 101
- fractal surface 68–69
- frost formation mechanism 282–284
- g**
- grafting 105
- h**
- heterogeneous nucleation 176
- heterogeneous wetting 242
- hierarchical structure 66–68
- homogeneous nucleation 176
- homogeneous wetting 242
- hot-filament CVD (HFCVD) system 141
- hydrodynamic model 76
- hydrothermal method 101–102
- i**
- ice adhesion 376
- ice crystallization
 - anti-adhesion icing
 - properties 176–179
 - mechanism 174–176
- ice formation
 - classical ice nucleation
 - theories 277–279
 - modified ice nucleation theories and surface conceiving 280–282
- indium tin oxide (ITO) 137
- in situ polymerization 253–254
- internal cutin layer (ICL) 34
- ion-responsive wettable
 - materials 206–207
- l**
- laser processing 93–95
- light-responsive materials
 - diarylethenes 200
 - gold nanoparticles 200
 - hydroxyl groups 196
 - inorganic oxides 196
 - nonpolar and hydrophobic
 - spiropyran 200
 - organic materials 199

- light-responsive materials (*contd.*)
 photoisomerized molecules 199
 SiO₂-NBS-F nanoparticles 197
 TiO₂ 197
 ZnO 196
 nanorod array-coated mesh
 films 197
 superhydrophobic surfaces 196
- lithography 209
 CFL process 90
 dry etching 89–90
 microfluidic technology 91
 NIL techniques 90
 PDMS microstructures 89
 polydimethylsiloxane (PDMS)
 layers 91
 polymethyl methacrylate resist
 film 89
 prototyping and replica
 molding 89
 silicon surface 92
 soft lithography 89
 soft stamps 90
 superoleophobic surfaces 92
 ultraviolet nanoimprint lithography
 (UV NIL) and hydrothermal
 synthesis 91
 viscosity and surface effect 91
- lotus effect 2, 26, 40, 86, 162
- lotus leaf
 high WCA and low CAH 27
 micro-papillae 26
- m**
- magnetism-responsive surfaces 209
- marshmallow-like microporous
 methyltrimethoxysilane-
 dimethyldimethoxysilane
 (MTMS–DMDMS) gels 241
- metallic oxides 135–138, 374
- methylmethacrylate (MMA) 142
- microfluidic channels 145
- microfluidic technology 91
- Mie scattering effect 98
- Mie scattering theory 129
- molecular kinetic model 76
- mosquito eyes 33, 284, 296
- multiple-responsive
 surface 214–217
- multiwall carbon nanotubes
 (MWNTs) 128
- Mussel-inspired deposition 254–255
- n**
- Nafion 142
- nanocoating materials
 electrodeposition 126–127
 inorganic materials 118–122
 inorganic–organic hybrid
 materials 123
 organic materials 122–123
- nanofibrillated cellulose (NFC)
 hydrogel 261
- nanoporous polydivinylbenzene
 (PDVB) 139
- nanoscale polypyrrole (PPy)
 particles 9
- natural superhydrophobic plants
 chemical composition 34–38
 hierarchical micro- and nanostructure
 surface 38
- lotus leaf 38
 high WCA and low CAH 27
 micro-papillae 26
- porous microsphere/nanofiber
 composite film (PMNCF) 39
- red rose petal surface 29–31
- salvinia effect 27–29
- NIL methods 91
- o**
- oil/water separation 375
 biodegradable poly(lactic acid) oil
 absorption and filtration
 materials 242
- carbon nanotube and
 graphene 259
 SWCNT/TiO₂ nanocomposite
 film 259
- cellulose-based
 nanomaterials 259–266
- deposition process, of
 dopamine 255
- electrospinning deposition 255

- fabric-based materials 234–236
 - facial superhydrophobic CNTs-PTFE
 - bulk material 241
 - metallic mesh-based materials
 - copper mesh films 233
 - fluorine-containing PTFE 230
 - infrared spectrometer oil content analyzer 232
 - LDPE coating 233
 - organics and carbon derivatives 233
 - PAM hydrogel-coated mesh 232
 - photo-controllable water permeation process 234
 - polydopamine 230
 - reversible pH-response and stability 230
 - seed growth hydrothermal synthesis method 232
 - VAMWNTs 233
 - modified ceramic separation membranes 251–253
 - Mussel-inspired deposition 254–255
 - non-two-dimensional separating methods 266–267
 - oil phase and medium-chain triglyceride (MCT) 250
 - particles and powdered materials 240–241
 - phase inversion process 255–258
 - polymer materials
 - in situ polymerization 253–254
 - polypropylene microfiltration membrane 254
 - “size-sieving” effect 250
 - sponge and foam-based materials 236–240
 - surfactants 250
 - wettability behaviour 242
 - oxidative chemical vapor deposition (OCVD) method 124
- p**
- PANI coating 12
 - p-conjugated polymers 212
 - phase inversion process 255–258
 - photochromism 13–14
 - pH-responsive wettable materials
 - amino groups 194
 - biotechnological applications 194
 - carboxyl groups 192
 - carboxylic acids groups 194
 - copper mesh film (CMF) 194
 - electrochemical deposition approach 194
 - hydrophobic/hydrophilic characteristics 192
 - PDMAEMA 192–193
 - polybases and polyacids 192
 - pitcher plants 298
 - plasma electrolytic oxidation (PEO) 128
 - polyaniline (PANI) 141
 - polydimethylsiloxane (PDMS) 143
 - polydopamine (PDA) walls 240
 - polyethylene terephthalate (PET) 141
 - polymer, poly(N-isopropylacrylamide) (PNIPAM) 200
 - poly(m-phenyleneisophthalamide) (PMIA) nanofibers 253
 - poly(p-xylylene) nanorods 171
 - polystyrene(PS) 140
 - polyurethane (PU) sponge 238
 - porous polydimethylsiloxane (PDMS) sponges 236
 - porous polymer films 145
 - porous polyvinylidene fluoride (PVDF) membrane 251
 - primary cell wall (PCW) 34
 - protein adsorption 179–180
- r**
- red rose petal surface 29–31
 - regenerated cellulose (RC) nanofibers 203
- s**
- salvinia effect 27–29
 - scanning electron microscopy (SEM) 26
 - secondary cell wall (SCW) 34
 - self-assembly met 105
 - self-cleaning effect 6–9

- self-cleaning surfaces 144
 - self-healing mechanism 256
 - silica nanoparticle-assembled nanoscale porous structure (SNANPS) 133
 - silica nanoparticles (SiO₂ NPs) 146
 - silicone coatings 143, 147
 - silicone elastomers 138
 - 3-[tris(trimethylsilyloxy)-silyl] propylmethacrylate (SiMA) 142
 - simple dip coating method 133
 - SiO₂ nanoparticles (SiO₂ NPs) 254
 - size-sieving effect 250
 - skunk cabbage 298–299
 - slippery lubricant-infused porous surfaces (SLIPs) 336
 - snails 33
 - sol–gel process 95–97, 123–124
 - solid-liquid and liquid-air interface 62
 - solution immersion process 127–128
 - solvent-assisted micromolding (SAMIM) 203
 - solvent-responsive wettability surfaces 208
 - spiropyran 200
 - sponge and foam materials 236–240
 - spray process 125–126
 - spray pyrolysis technique (SPT) 135
 - springtail 31
 - stress-responsive surfaces 213
 - superhydrophobic nanocoatings 118
 - chemical vapor deposition (CVD) 124–125
 - electrospinning process 126
 - sol–gel process 123–124
 - solution immersion process 127–128
 - spray process 125–126
 - superhydrophobic surface (SHPSs) 86
 - vs. condensed water droplets 316–324
 - inter-droplet ice bridging and edge-initiation effect 321–324
 - jumping droplets, electrostatic charging 317–321
 - wetting transition 316–317
 - contact time
 - minimization 312–313
 - deposited water droplets
 - droplet rolling behaviour 299–303
 - sessile water droplets freezing 303–307
 - environmental condition 332
 - ice adhesion test apparatus and ice adhesion criteria 335
 - ice detachment tests 332
 - ice-ice cohesive strength 333
 - ice-substrate adhesive strength 333
 - vs. impact water droplets 309–312
 - impact resistance improvement 307–309
 - oblique impact 313–316
 - structural stability 335
 - superoleophobic surfaces 92
- t**
- temperature-responsive wettable materials
 - chemical composition and rough surface 201
 - copolymer films 203
 - low critical solution temperature (LCST) 201
 - PNIPAM homopolymer 202–203
 - regenerated cellulose (RC) nanofibers 203
 - SAMIM 203
 - superhydrophobic carbonnanotube (CNT) 205
 - tin oxide (SnO₂) 136
 - titanate nanobelt (TNB) 136
 - titanium dioxide (TiO₂) 136
 - trimethylchlorosilane (TMCS) 40
- u**
- UV light-stimulation 168

V

vinylmethyldimethoxysilane
(VMDMS) 95
vinyltrimethoxysilane (VTMS) 95

W

Wenzel model 25, 59, 62–64, 72–74,
87, 373

wettability 1
wetting behavior 1

Y

Young's model 25

Z

zinc oxide (ZnO) superhydrophobic
coating 135

