Index

a
A-B-A block copolymer 11, 43, 54
– PHS-PEO-PHS 43
ab initio emulsion polymerization 209, 217
absorption spectroscopy 173
2-acrylamido-2-methyl-1-propanesulfonic acid (AMPS) 252, 281, 283, 286
acrylic polymer 211
– butyl acrylate (BA) 211
– clay nanocomposites 226
– methyl methacrylate (MMA) 211
adsorption process 12
aliphatic epoxides 109
– dimethylsulfoxide (DMSO) 109
alkylammonium cation(s) 248, 302
amino-undecanoic acid (AUA) 250, 256
– derivatives 250
ammonium peroxodisulfate (APS) emulsion 268
– polymerization process steps 268–269
amphiphilic dextran(s) 111, 116–118, 123, 125
– derivatives 117, 125
– emulsifying properties 111
amphiphilic lipid molecules 229
– phospholipids 229
amphiphilic polymer 114, 191
– block copolymers 191
– grafted polymers 191
anionic molecular surfactant 128
– sodium dodecyl sulfate (SDS) 128
anionic polymerization 192
anionic surfactant 174, 177, 278, 281
– AOT 278
– SDS 281
anisotropic metal nanoparticles 157, 167–180, 183
– inverse microemulsion 157
– preparation 157
– synthesis 164, 183
armored latex, see clay platelets
aromatic epoxide 109
– phenylglycidylether 109
asymmetric straight-through microchannel array 151
– schematic illustration 151
atomic force microscopy (AFM) 59
Avogadro’s constant 14
azoisobutyronitrile (AIBN) 108, 278
– 2,2’-azoisobutyronitrile 278

b
Bancroft rule 23, 198, 205
batch miniemulsion copolymerization 215
– formulation 215
B/C network 90, 93
– decoration of nodes 93
B/C system 91, 92
– $F_0$ components 92
benzoyl peroxide (BPO) 260, 262, 298
– concentration 260
blank emulsion latex (BE) 213
blank miniemulsion latex (BM) 215, 223
– small-angle X-ray scattering patterns 223
Bloch’s law 259, 307
block copolymer 192–195, 197–199
– biocompatibility 194
– biodegradability 194
– emulsifier(s) 199, 205
– micelles 194
– use 192
Boltzmann constant 10, 59
bovine serum albumin (BSA) 129, 145, 146
Bragg’s law 301
breakdown processes 75
  – coalescence 75
  – flocculation 75
  – Ostwald ripening 75
  – phase inversion 75
Brownian diffusion 32, 35, 43, 51, 60
Brownian motion 2, 51, 163
bubble pressure technique 48

**c**
calcein-containing W/O emulsions 235
  – fluorescent microphotographs 235
capping agents 177, 297
cation-exchange capacity (CEC) 211, 249
cationic amphiphilic comb-like copolymers 122
cationic exchange process 249
cationic surfactant 145, 172, 292
  – cetyl trimethyl ammonium bromide (CTAB) 145
  – tri-n-octylmethylammonium chloride (TOMAC) 145
ceria nanoparticle 179
  – self-assembly 179
cerium oxide nanorods 178
  – diagrammatic images 178
  – selected area electron diffraction (SAED) 178
cetyl trimethyl ammonium bromide (CTAB) 145, 159, 168, 173, 180, 268, 284
  – concentration(s) 169, 179
  – derivatives 250
  – micelles 172
  – monomers 173
  – surfactant 164
charge-stabilized emulsions 41
Chern’s study 282
clay platelets 246, 258, 306
clay/polymer nanocomposites 260
Cloisite 30B monomer dispersion 220
  – small-angle X-ray scattering patterns 220
Cloisite clays 247, 261
Cloisite inorganic fillers 296
Cloisite platelet(s) 271, 273, 277, 282
  – polymer-modified 273
cluster insertion energy 84–90
  – definition 84
cluster transformation energy 85–90
coefficient of variation (CV) 133, 233
cohesive energy ratio (CER) concept 29–31
  – interaction parameters 30
colloidal forces 249, 304
colloidal particles 9
  – assessment 201
  – stability 201
computational fluid dynamics (CFD) 141
  – analysis 141
  – calculations 147
  – method 153
  – results 142
  – simulation 141
  – studies 154
crystal concentration 53
  – viscoelastic properties 53
coprecipitation reaction 166
cosmetic emulsions 97
  – application 97
  – physical chemistry 97
  – sensory properties 97
critical aggregation concentration (CAC) 202, 270
critical association concentration, see critical micelle concentration (CMC)
critical coagulation concentration (CCC) 202
  – values 202
critical flocculation concentration (CFC) 40
critical flocculation temperature (CFT) 40
critical fluctuation volume (CFV) 40
critical micelle concentration (CMC) 14, 15, 69, 169, 173, 179, 263, 305
  – values 271
critical packing parameter (CPP) 31
cryo-transmission electron microscopy 279
cutting-edge semiconductor microfabrication techniques 152
cyanoacrylate anionic polymerization 127
  – soft-chemistry techniques 184

**d**
Debye attraction forces 7
Debye–Huckel parameter 9
defined nanoparticles preparation 123
  – poly(butylcyanoacrylate) 126
  – poly(styrene) 123
degree of hydrophobic modification 110
degree of polymerization (DP) 68, 193
depletion flocculation 37
  – schematic representation 37
Deryaguin–Landau–Verwey–Overbook (DLVO) theory 10, 71
  – calculation 71
  – energy-distance theory 10
dextran 108, 110, 126, 127
  – amphiphilic derivatives 108, 114, 126
  – anionic derivatives 112, 118
  – chains 126
  – chemical modification 110
emulsions creaming 32–37
– prevention 35–37
– schematic representation 33
emulsion selection 31
– critical packing parameter 31
emulsions rheology 46
– bulk rheology 50
– concentrated emulsions rheology 51
– interfacial dilational elasticity 47, 48
– interfacial dilational viscosity 48
– interfacial rheology 46, 47
– interfacial viscosity measurement 47
– non-newtonian effects 49
emulsion stability investigation 59
– using INUTEC® SP1 59, 60
emulsion systems 4
– physical chemistry 4, 5
entrainment yield determination 232
epoxides 107, 109
– aliphatic 107, 109
– aromatic 107, 109
ethylene glycol (EG) 175
ethylene oxide (EO) units 15
European synchrotron radiation facility (ESRF) 216

f
facial make-up 97
– emulsified fluid foundation 97
Fanning’s friction factor 136
film pressure balance technique 69
floculation kinetics 38, 39
floculation process 36
floculation rate 40
Flory–Huggins interaction parameter 11
fluffy structure 306
foam film destabilization 80
food emulsions 3
foundation bulk drying 99
foundation D 102
– drying 99, 100
– viscosity/evaporated mass curve 102
foundation jams 103
fragmentation process 90
free polymer 37
free radical reactions 306

g
γ-gradient 22, 23
gas chromatography (GC) 99
gas constant 20
gel-permeation chromatography (GPC) 212, 218
gel polymer formation 222
gel-sol method 165
giant vesicles (GVs) 229, 234, 236, 238, 240
– average diameters 236
– diameter 241
– entrapment efficiency 229
– mechanical stability 238
– membranes 229
– microphotographs 234
– preparation characteristics 229
– size control 229, 234
– structure 236
– suspension 232
giant vesicles formation 231–232, 239, 240
– characteristics 237
– schematic flowchart 239
giant vesicles preparation process 233, 238
– monodisperse W/O emulsions 233
Gibbs adsorption equation(s) 14, 15, 20
Gibbs adsorption isotherm 13–16
Gibbs approach 13
Gibbs–Deuhem equation 5, 13
Gibbs dividing line 4
Gibbs elasticity 43, 44, 47, 48, 62
Gibbs free energy 13
Gibbs–Marangoni effect 23, 24
– schematic representation 23
Gibbs model 4
gold nanoparticles 168
graft copolymer 76
gram-scale synthesis 183
gravitational field system 90
– evolution 90
gravity force 93

h
Hamaker constant 8, 12, 38, 50, 71
Hansen solubility parameters 301
Harkens spreading coefficient 79
hexadecyltrimethylammonium bromide (HDTMAB) 249
hexane continuous-phase removal process 240
high-internal-phase emulsions, see dry foams
high-molecular-weight polymers 35
high-molecular-weight surfactants 28
high-speed stirrer(s) 16, 18, 58, 76
– colloid mills 18
– high pressure homogenizers 18
– Silverson mixer 16
– ultrasound generators 18
– Ultra-Turrax 16, 18, 58, 76
homogeneous nucleation 269
homogenization/degradation mechanism 266
HPPS instrument 59, 108, 109
hydrating shower cream 77, 79, 80
  – compositions 77
hydrogenated tallows (HTs) 248
hydrogen-bonding component(s) 301, 303
hydrophilic block copolymer 200
hydrophilic chains, see PEO chains
hydrophilic-lipophilic balance (HLB) concept 25–27
hydrophilic-lipophilic balance (HLB) number(s) 23, 26–28, 29, 46, 197, 198
  – chemical structure 198
hydrophilic molecule entrapment 234
hydrophobically modified dextrans synthesis 109–111
hydrophobically modified inulin (HMI) 43, 57, 58, 65, 81
  – INUTEC® SP1 43, 57, 58, 65, 81
hydrophobic clay platelets 220
2-hydroxyethyl methacrylate (HEMA) 280
incipient flocculation 40
inner-sphere sites 294
in situ polymerization 283
interdroplet mass transfer 265
interfacial dilational modulus 21
interfacial rheology correlation 49
  – emulsion stability 49
  – mixed surfactant films 49
  – protein films 49
interfacial tension 19, 47, 85, 86
  – definition 86
  – gradient 21
intermicellar exchange rate 166
intermicellar interactions 183
INUTEC® SP1 57, 60–63, 69, 73, 76, 79–81
  – adsorption 79
  – application(s) 57, 81
  – concentration 69
  – conformation 79
inverse emulsion(s) 278, 280
  – polymerization 280
  – stabilization mechanism 278
in vivo drug carriers 158
ionic stabilizer 180
  – CTAB 180
ionic surfactant(s) 9, 14, 15
  – sodium dodecyl sulfate (SDS) 14
isotropic metal nanoparticle(s) 157, 166, 167, 179
  – inverse microemulsion 157
  – preparation 157
  – synthesis 164

k
Karl Fischer coulometer 232
Karl Fischer method 99
Keesom attraction forces 7
kinetic exchange process 44, 160
Kolmogorov theory 237

l
laminar flow (LV) 18, 19
  – laminar/viscous regimes 19
  – turbulent/inertial regimes 19
  – turbulent/viscous regimes 19
Laplace’s law 237
Laponite composite system 246
latex suspensions 128
  – colloidal properties 128
Leica DMLB optical microscope 99
Lewis acids 305
Lifshitz–Slesov–Wagner (LSW) theory 61
light-scattering measurements 221, 265
light-scattering techniques 196
lipid hydration process 232
liquid foundations characterization methods 98, 99
  – characterization methods 98, 99
  – drying rate determination 99
  – flow rheology 99
  – foundations drying 99
  – selection 98
liquid/liquid interface 46
London dispersion constant 7, 8
London dispersion interactions 7, 8
L/W ratio 237, 238, 240

m
macromolecular surfactants 29
magnetic nanoparticles 182, 184
magnetic resonance imaging (MRI) agents 182
MALDI-ToF mass spectrometry 196
Marangoni effect 22
Mark–Houwink–Sakurada constants 216
massage lotion 76–79
  – compositions 77
  – formulation 76–79
membrane emulsification technique 134
membrane lysis tension 237
metal nanoparticle(s) 167, 181, 183
metal nanoparticles preparation method 158
  – chemical reduction 158
  – coprecipitation 158
metal particles formation 162
  – mechanism 162
metal salt/precursor 165
  – Co(AOT)₂ 165
methyl methacrylate (MMA) 218, 252, 254, 260, 270, 274, 287
  – dispersion state 254
  – monomer 218, 287
  – polymerization 260, 274, 287
  – suspension polymerization 270
micellar systems 263–281
  – radical polymerization 263
micellar template mechanism 168, 169
  – parts 170
micelle 263
  – aggregates 271, 305
  – nucleation 268, 269, 282
  – rod-like structures 179
  – schematic illustration 263
  – template-based primary nanorods 179
  – template growth 168
  – template mechanism 170
microchannel array (MC) 134–137, 139, 151, 153
  – devices 139
  – plate(s) 144, 231, 233
microchannel emulsification
  – devices 134
  – principles 135–137
  – process 134–136, 230, 231
  – study 146
microchannel module 230
microemulsion polymerization
  – mechanism 264, 265
microemulsion(s) 159, 178, 180, 181, 264, 273, 306
  – based approach 179
  – droplet dimensions 160
  – mediated synthesis process 177, 180
  – microwave method 181
  – polymerization 273, 306
  – production 158
  – reduction technique 182
  – role 264
  – system 167, 169
  – technique 179
microfluidic channel devices 134, 229
microinterferometric technique 68
microscope video system 232
miniemulsion aging rate 122
  – temperature effect 122
miniemulsion polymerization
  – processes 114, 115, 120, 124, 129, 210, 211, 219, 267, 276
  – mechanism 114, 267
miniemulsions stability 114
  – polymerization duration 114
molecular diffusion process 122
molecular surfactants 118
  – sodium dodecyl sulfate 118
molecular weight distribution (MWD) 216
monodisperse emulsion(s) 133, 139, 140, 148, 151
  – production developments 133
monodisperse water-in-oil (W/O) emulsions 229, 230, 233
monomer-coemulsifier interactions 264
monomer droplets composition effect 119
monomer polymerization 270
monomer-swollen micelles 269
montmorillonite (MMTs) 219, 225, 243
  – clays 209
  – platelets 225
multiple emulsion(s) 57, 64
  – INUTEC® SP1 63, 64
  – optical micrographs 64
  – preparation methods 58
  – stability 64

n
nanocomposite latex films 215, 219, 223–225
  – transmission electron microscopy images 219, 224, 225
  – wide-angle X-ray diffraction patterns 224
nanoemulsions 57
  – emulsions stabilization 57, 60
  – using INUTEC® SP1 60
nanoemulsions preparation methods 58, 191
  – poly(caprolactone)-b-poly(ethylene oxide) block copolymers 191
  – spontaneous emulsification 191
nanometer-scale magnetic particles 158
nanoparticle formation process 163
  – steps 163, 164
nanoparticle growth 172
  – kinetic parameters 172
nanoparticle preparation 107, 162–164, 179
  – key parameters 179
  – miniemulsion polymerization 107
nanoparticle suspensions 129
  – colloidal properties 129
nanoprecipitation process 193, 198
nanorods 170, 179
  – self-assembly 179
nanoscale magnetic materials 183
  – physical properties 183
nanoscale particles 157, 167
  – properties 157, 158
natural clay 248, 302
natural Cloisite (Cl<sub>n</sub>) 258, 294
negatively stained nanocomposite latexes 225
– transmission electron microscopy 225
N,N'-methylenebisacrylamide (NDA) 278
nonadsorbing polymer, see free polymer 11, 15, 26, 27, 46, 278
– alcohol ethoxylates 15
– Tween 85 278
– Span 80 278
– water 217, 221, 228
nonionic surfactant(s) 11, 15, 26, 27, 46, 278
– alcohol ethoxylates 15
– Span 80 278
– Tween 85 278
– softener 76
nonseeding method 170, 183
nuclear magnetic resonance (NMR) 294
nucleation-growth kinetics 172
nucleation/growth mechanism 193, 211

oil emulsions 203
– emulsification process 197
– spontaneous emulsification 203
oil-in-water (O/W) dispersions 191
– emulsions 191
– latexes 191
– suspensions of polymer 191
oil-in-water (O/W) emulsion(s) 23, 27, 28, 32, 34, 52, 107, 108, 123, 129, 143, 146, 148, 193, 200
– activation energy 123
– droplet generation 143
– interfacial tension variation 28
– sonication 108
oil-in-water (O/W) interface 42, 44, 49, 51, 65, 68, 78, 141, 143
– time course 143
oil-in-water (O/W) miniemulsions
preparation 111
– droplet size control 111
– polymer structure 112
oil-in-water (O/W) system 31, 136, 145–147, 151, 153
– interfacial properties 145
– isoelectric points 146
– preparation conditions 145
organically modified clays (O-MMT clay) 213, 214, 284
– wide-angle X-ray diffraction patterns 213
organically modified silicates (OLS) 247, 280
organic latex particles 246
oscillating bubble technique 48
Ostwald ripening 3, 41–43, 61, 63, 107, 116, 122, 265
– rate 117, 120, 123
– rate constant 62
– schematic representation 42
particle aggregation process 102
peanut-like hematite (α-Fe<sub>2</sub>O<sub>3</sub>) crystals 165, 176
– synthesis 165
Pearson’s hard-soft acid-base (HSAB) principle 297
percolation process 161
personal-care formulations 75, 76
– hydrating shower cream 76
– massage lotion formulation 76
– polymeric surfactants 75
– soft conditioner 76
– sun spray (SPF19) 76
phase inversion process 45, 46
– catastrophic inversion 45
– transitional inversion 45
phase inversion temperature (PIT) concept 27–29
– value 29
photon correlation spectroscopy, see dynamic light scattering
pickering emulsion(s) 246, 279, 306
– stabilization 273, 284
plateau angles 84
plateau value 20, 22
play-time 97, 104
– definition 97
Poisson–Boltzmann equation 71
polydispersity index (PDI) 217, 222, 279
poly(ether-block-amide) copolymer hybrids 289
poly(dimethylsiloxane) (PDMS) emulsions 53
– η<sub>η</sub>–Φ curves 53
polydisperse emulsion 140, 149
polydispersity index (PDI) 217, 222, 279
poly(ether-block-amide) copolymer
scanning electron microscopy (SEM) 279
Scatchard equation 113
seeded semibatch emulsion copolymerization 213, 214, 217
– formulation 214
seeding-autocatalytic growth mechanism 164
selected area electron diffraction (SAED) 177
self-assembly process 177
semi-quantitative theory 19
shear thinning system 35
shirasu porous glass (SPG) membranes 133
size-exclusion chromatography (SEC) 216
– disposition 102
– play-time 102
slow coagulation regime 202
small-angle light scattering (SALS) 197
small angle X-ray scattering (SAXS) 209, 216, 220, 221
– experiments 216
– measurements 220
– scattering profile 221
Smith–Ewart theory 268
Smoluchowski rate 39
sodium bis(2-ethylhexyl)sulfosuccinate (NaAOT) 159, 160
– containing microemulsion solution 175
– containing microemulsion system 174, 180
– microemulsions 177
sodium dodecyl sulfate (SDS) 23, 49, 268, 271
– c-values 23
– micelles 254, 304
sodium lauryl sulfate (SLS) 211
sodium montmorillonite (Na-MMT) clay 209, 212, 224
– chemical structure 212
– WAXD diffraction patterns 224
soft conditioner 77, 80
– compositions 77
soft template effect 177
sol-gel methods 181
sorbitan mono-oleate 27, 230
Soxhlet extraction 216
spontaneous emulsification process 193, 198
stabilization process 75
– enhancement 75
steric repulsion 11, 12
steric stabilization process 38, 57
steric stabilization theory 12
sterically stabilized emulsions flocculation 40, 41
– schematic representation 40
Stern/zeta potential 9
stirred-tank reactor 213
Stokes–Einstein equation 38, 59
Stokes' velocity 34
straight-through microchannel array devices 133, 135, 137–139, 146, 148–150, 152–154
– scaling-up 149, 150
straight-through microchannel plate 138, 149, 150, 153
styrene 115, 244, 245, 270, 275, 285, 286
– colloidal parameters 275
– emulsion polymerization 285, 286
– emulsion retardation factor 121
– emulsion(s) 119, 121
– free-radical miniemulsion polymerization 115
– in situ polymerization 244, 245
– microemulsion polymerization 275
– miniemulsion kinetic data 115
– miniemulsion polymerization 270
– vinyloxazoline copolymer 245
submicronic colloidal systems 107
– domains 107
sun spray (SPF19) 77, 81
– compositions 77
– supra-aggregate 178–180
– formation 178, 180
– self-assembly 179
surface dilational modulus 22, 42
surface viscometers 47
– schematic representation 47
surfactant-based methods 164–166
surfactant film(s) 44, 163
surfactant molecules 12
– orientation 12
surfactant replacement process 232
surfactants adsorption 12–25
– liquid/liquid interface 12
swallow-tail family 289
– P15A 289
– P20A 289
– P93A 289
symmetric bulk crystal structures 167
synthetic Cloisite (Cl S) 259, 294


tallow chains 248
template mechanism 172
thermogravimetric analysis (TGA) 288
three-phase cellular fluids 83
– external force field effect 83
transformation energy(ies) 88, 89
transmission electron microscopy (TEM) 174, 217, 218
– images 174, 218
tri-n-octylmethy lammonium chloride (TOMAC) 145
tris-HCl buffer(s) 230, 232
Triton X-100 solution 232, 233
turbulent flow (TV) 18, 19
turbulent inertial regime 19

u
Ultra-Turrax homogenizer 58
ultraviolet (UV)-visible spectra 172

v
van der Waals attraction 7–10, 37, 38, 40, 43, 67, 128, 253, 254, 302
– types 7
van der Waals energy-distance curve 8
velocity gradient 19
vibrating sample magnetometer (VSM) 259
– data 259
vinylbenzyl-dimethyldodecylammonium chloride (VDAC) 249
vinyl monomers 278
– emulsion polymerization 278
viscosity evolution 100–102
– drying time 101
viscosity plateau, see quasi-plateau

w
waterborne acrylic/clay nanocomposites 209
– synthesis routes 209
waterborne nanocomposites 210, 217, 219
– coagulum-free 210
– emulsion polymerization 213, 217
– latexes 214
– miniemulsion polymerization 214
– MMT nanocomposites synthesis 213, 214
water-borne polymers 267
– clay nanocomposites 210
– preparation 267
water-in-oil emulsion(s) 45, 46, 58, 59, 64, 230, 234, 236, 241
– Arlacel P135 58, 59, 64
– preparation 230
water-in-oil emulsion water droplets 235
– size distributions 235
water-in-oil microemulsion(s) 159, 161, 181
– sol-gel route 181
– use 161
water-insoluble materials 266
– organic pigments 266
– polymers 266
– resins 266
water/oil-soluble polymers 260
water-soluble fluorescent dye 230
– calcein 230
water-swollen micelles 264
wide-angle X-ray diffraction (WAXD) 212
– analysis 216, 288, 292
– diffraction patterns 218, 219
WinROOF image analysis software 232
Winsor R_c concept 29
worm-like micelle template 169

x
X-ray diffraction patterns 250, 253, 284
X-ray diffraction spectra 255
X-ray diffraction studies 284
– homopolymers 284
X-ray diffraction (XRD) analysis 212, 255

z
zeolite nanocrystals 181
zwitterionic polymerizations 126