

Index

- a**
- abstractions
 - hydrogen 413
 - accelerated diffusion 262
 - acetal groups 451
 - acetate
 - α -naphthyl 408
 - vinyl 338
 - acetonitrile 273
 - acetylation, enantioselective 290
 - acid-catalyzed processes 219
 - acid-catalyzed reactions 452
 - acid-sensitive functional groups 222
 - acids
 - alkylcarbonic 448, 449
 - atropic 138
 - benzoic 162
 - carbonic 221, 449
 - carboxylic 460
 - decanoic 379
 - dimeric hydroxy 351
 - fatty 23
 - *in situ* generation 120
 - levulinic 195
 - natural carbonic, scCO₂ 9
 - peroxocarbonic 147
 - poly(glycolic acid) 351
 - poly(L-lactic acid) 351
 - reactor cleaning 58
 - solid 149
 - tiglic 138
 - active hydrogen 469
 - acylation 233, 435
 - acylhydroquinones 405
 - addition
 - cycloaddition 221
 - photo- 225
 - propargylic alcohols and amines 205
 - adjustable solvating power 8
 - adsorption isotherm 388
 - aerogels 381
 - agglomeration, particles 311
 - aggregated nanoparticles 379
 - AISI, material number 36
 - alcohols
 - benzyl 162
 - enantioselective acylation 233
 - propargylic 205
 - alcoholysis, lipase-catalyzed 284
 - aldehydes
 - cinnam- 195
 - sacrificial 206
 - aliphatic polycarbonates 342
 - alkaline phosphatase 230
 - alkanes
 - free radical chlorination 411
 - iso- 262
 - supercritical 3/1, 374
 - alkene metathesis, Grubbs catalyst 148
 - alkoxides 344, 381
 - alkyl aromatics 410
 - alkylation 255, 266
 - Friedel-Crafts 422
 - alkylcarbonic acid 448
 - carbonic acid 449
 - allylic amines 123
 - aluminum alkoxides 344
 - amides, hydrolysis 461
 - amidine-functionalized phosphine ligand 128
 - amination, aromatic 211
 - amines 205
 - allylic 123
 - carbamate protection 212
 - secondary 124
 - tertiary 124

- ammonia, synthesis 20
 ammonium salt-catalyzed reactions 436
 amorphous films 391
 amphiphatic polymers 318
 analytes, electrochemical 420
 anchoring strength 328
 anhydride, maleic 193, 194
 anhydrous media 283
 aniline 452
 anionic polymerization, coordinative 348
 anthracene 227
 anthraquinones, functionalized 258
 anti-inflammatory drug, non-steroidal 138
anti:syn ratio 404
 AOT, *see* bis(2-ethylhexyl)sulfosuccinate
 applications
 – electrochemical reactions 429
 – emulsions 174
 – industrial 16
 – SCFs 9
 aqueous (phase) reforming 470
 aqueous–SCF biphasic systems 159
 aromatic amination 211
 aromatics, alkyl 410
 Arrhenius plot 445, 448
 artificial enzymes 338
 asymmetric binary mixtures 88
 asymmetric hydroformylation, styrene 203
 asymmetric hydrogenation 198
 – atropic and tiglic acid 138
 atactic PMMA 326
 atropic acid 138
 attenuated total reflection mode (ATR) 56
 Aufbau reaction 14
 autoclave 18, 53
 automated supercritical flow reactors 69
 autotuning procedures 48
 aza-Diels–Alder reactions 223
- b**
- Bacillus circulans* 231
Bacillus megaterium 289
 back-pressure regulator 69, 72, 166, 296
 backbone, π -conjugated 345
 Baeyer–Villiger oxidation, ketones 208
 base-catalyzed processes 218
 batch processes 41
 – dosage 60
 Baylis–Hillman reaction 218
 Beckmann rearrangement 463
 benzaldehyde 284, 459
 benzene, diffusion coefficients 115
 benzoic acid 162
 benzyl alcohol 162
 bifunctional monomers 334
 binary mixtures, asymmetric 88
 binary phase diagrams 86
 biocatalysis 150
 biodiesel 287
 biomass 465, 470
 biotransformations 229
 biphasic catalysis 23
 biphasic reactions, emulsions 172
 biphasic systems
 – aqueous–SCF 159
 – classification 101
 – $t\text{-L-scCO}_2$ 294
 – liquid–SCF 101, 159
 – phase behavior 102
 – polymer–SCF 167
 bis(2-ethylhexyl)sulfosuccinate (AOT) 374, 375
 bond migration, double 210
 bonding, hydrogen 117, 439
 boron trifluoride 347
 branched pentablock copolymers 350
 bromination, free radical 410
 bromine, molecular 411
 Brookhart catalyst precursor 341
 Brownian movement, thermal 312
 bubbling 402
 bulk density 3
 bursting discs 53
 butene, supercritical 154
- c**
- caffeine 162
 cage effects 412
 caged radical pairs 407
 Cagniard de LaTour 10, 11, 16
Candida antarctica 283, 290
 Cannizzaro reaction 459, 473
 canon de fusil 11
 capping agents 370
 capping ligands, organic 373
 caprolactone 350
 – ϵ - 348
 carbamates 212, 219, 285
 carbohydrates, biomass conversion 465
 carbon molecular sieves (CMS) 391
 carbon nanocages 385
 carbon nanomaterials 383
 carbon nanotubes (CNT) 383, 390
 – multiwalled 383, 384
 carbonic acid 221
 – alkylcarbonic acid 449
 – natural, scCO_2 9
 carbonyl photochemistry 405

- carbonylation 139
 - free-radical 229
 - Pauson-Khand 142
- carboxylation 234
- carboxylic acid 460
- catalysis
 - bio- 150
 - biphasic 23
 - chemisorption of gases in liquids 120
 - electro- 149
 - enzymatic 281, 294
 - expanded liquid phases 101
 - heterogeneous catalysis 18, 243
 - multiphase 101
 - phase transfer 435
- catalysts
 - acids 219
 - ammonium salt 436
 - bases 218
 - Brookhart precursor 341
 - catalyst-rich surface phase 437
 - cobalt 142
 - colloids 163
 - Grubbs 123
 - heterogeneous 472
 - heterogenized catalyst systems 141
 - immobilization 263
 - lipases 282, 284, 286
 - lipophilic phase transfer 437
 - mesoporous 248
 - metallocene 340
 - metals 214, 342
 - noble metal 258
 - Novozym 290
 - palladium 127, 208
 - Phillips 340
 - pore effectiveness factor 250
 - porphyrin-type 343
 - product/catalyst separation 154
 - rhodium 204, 263
 - ROMP 345
 - ruthenium-based Grubbs-type 346
 - solid acids 149
 - stabilization 155
 - switchable solvents 124
 - Wilkinson's 170
 - zeolite 262
 - Ziegler-Natta 341
 - zinc complexes 343
- cationic polymerizations 346
- cell
 - electrochemical 421
 - variable-volume view 42
- ceria nanocrystals 379
- chain hopping 343
- chain polymerizations, ionic 346
- chain reactions, radical 410
- chemical fixation, CO₂ 19
- chemical functionality of solutes 94
- chemical reactions 16
- chemical strains 34
- chemical synthesis, SCFs in 6
- chemisorption, gases in liquids 120
- chemistry
 - electrochemical reactions 243
 - green chemistry 243
 - macromolecular 304
 - NCW and scH₂O 457
- chemoenzymatic reactor 297
- chemoselectivity, enzymatic catalysis 281
- chiral sensitizers 409
- chlorides, mono-/poly- 413
- chlorinated solvents 58
- chlorination 403, 411
- chromatography 14, 86
- cinnamaldehyde 195
 - solventless hydrogenation 136
- citral 191
- citronellol 232
- classification, biphasic systems 101
- clays, natural 391, 393
- cleaning, reactors 57, 67, 69
- cleavage, photo- 405
- clustering, solvent-solute/solute-solute 8, 399
- CMS, *see* carbon molecular sieves
- CNT, *see* carbon nanotubes
- CO₂
 - CO₂-expanded liquids (CXLs) 103, 169
 - CO₂-induced liquefaction 137
 - electroreduction 428
 - phase diagram 2
 - physical properties 306
 - quadrupole moment 83
 - self-diffusivity 79, 80
 - supercritical, scCO₂ 4
 - thermal conductivity 84
 - water-in-CO₂ microemulsions 374
- co-reductant, sacrificial 146
- coating 392
 - free enzymes 292
- cobalamine complex 332
- cobalt-catalyzed cycloaddition 142
- coexistence curve, liquid-vapor 77
- coil expansion factor, hydrodynamic 310
- coke 266
 - biomass conversion 468
- colloid-catalyzed reduction 166

- competition experiments 411
 complexation of polar substrates 285
 complexes
 – cobalamine 332
 – monophos 201
 – Schiff base-type metal 344
 – solid-supported metal 199, 200
 – zinc 343
 compressed gases 5
 – multiphase catalysis 101
 compressed liquids, thermophysical properties 375
 compressibility 247
 compression 33
 compressors, diaphragm or reciprocating 34
 computational approaches 190
 condensation 66, 462
 conductivity, thermal 84
 configurational entropy 308
 continuous flow processes 154, 166
 – dosage 61
 – solventless hydroformylation 172
 continuous flow reactors 44
 continuous green enzyme reactor 296
 continuously stirred tank reactors (CSTRs) 45
 controlled pore glasses (CPGs) 249
 “controlled” radical polymerization (CRP) 316, 331
 controller, mass flow 61, 65
 conversion
 – biomass 465
 – heterogeneous catalysis 252
 coordinative anionic polymerization 348
 copolymers 324, 350
 Coriolis mass flow controller 62, 63
 corresponding states, law of 1
 corrosion 33, 35, 471
 – risks 67
 cosolvent tuning 8
 coupling reactions 435
 – Heck reactions 177, 211
 – palladium-mediated 208
 cracking 270
 – stress corrosion 35
o-cresol, oxybromination 122
p-cresol 446
 critical end-points 89, 92
 critical line, mixtures 88
 critical opalescence 247
 critical point 11
 critical pressure/temperature 1
 critical solution temperature, upper 442
 critical temperature, low 62, 63
 cross-linked enzyme crystals 293
 cross-linked PDMS 170
 crossover pressure 97
 crystallization
 – solutes 130
 – SSEC process 382
 – tunable 130
 crystallization curve 321
 crystals
 – cross-linked enzyme 293
 – nanocrystals 293
 CSTRs, *see* continuously stirred tank reactors
 cutinase 291
 CXLS, *see* CO₂-expanded liquids
 cyclic voltammetry (CV) 419
 cycloaddition 221
 – cobalt-catalyzed 142
 – 1,3-dipolar 224
 cyclohexane
 – chlorination 403
 – homogeneous oxidation 144
 – partial oxidation 464
 cyclohexanone 162
 cyclopropanations, enantioselectivity 217
- d**
- damping effects, substituents 95
 DDM, *see* diazodiphenylmethane
 deactivation, enzymes 291
 decanoic acid 379
 decomposition, hydrothermal glycine 468
 decoration, nanoparticles 388
 degradation, lignin 468
 dehydration 461
 – selective 467
 dehydrogenation 253, 260
 delivery system, SCF 421
 dendrimers 209, 383
 denitrogenation 225
 density
 – density–pressure plane 78
 – expanded liquid phases 109
 – fluctuations 247
 – local augmentation 3
 – SCFs 3
 – solvents 304
 – water 439, 440
 deposition, nanoparticles on porous supports 390
 depressurization 67
 depressurized gas streams 66
 desorption 250
 detection, electrochemical 429, 430
 diaphragm compressors 34

- diazodiphenylmethane (DDM) 448, 450, 451
- diazonium salts 451
- dielectric constant 81, 284
- NCW 440
 - water 82, 83, 440
- Diels-Alder reactions 221, 462
- diesel, bio- 287
- diethyl ether 11
- volumetric expansion 105
- diffusibility, scCO_2 58
- diffusion, accelerated 262
- diffusive caged radical pairs 407
- diffusivity (diffusion coefficient)
- benzene 115
 - effective 270
 - expanded liquid phases 114
 - *n*-pentane 249
 - SCFs 7
 - self-diffusivity 79
 - solutes 307
- difluoromethane 427
- digester 10
- dimeric hydroxy acids 351
- dimerization
- isophorone 404
 - photo- 403
- dimmers, head-to-tail 404
- dimethyl sulfoxide 435
- 1,3-dipolar cycloaddition 195
- direct synthesis
- nanocrystals 369
 - sol-gel 380
- directional interactions 308
- discharging devices, gases 34
- dispersion polymerization 320
- stabilizer design 310
- disproportionation 268
- dissociation constant, water 441
- dissolution, CO_2 168
- dosage
- batch processes 60
 - continuous flow processes 61
 - gases 58
 - liquids 63
 - solids 64
- dosing unit 63
- double bond migration 210
- double layers 427
- coating 392
- drug precursor 138
- drugs, anti-inflammatory 138
- dye, hydrophilic 132
- dynamic kinetic resolution 297
- e**
- edible oils 23
- effective diffusivity 270
- effectiveness factor 250
- pore 250
- EFL
- enhanced fluidity liquids 103
- electrocatalysis 149
- electrochemical cell 421, 429
- electrochemical detection
- on-line 430
- electrochemical reactions 419
- applications 429
 - ferrocene 420
 - solvents 423
- electrochemical synthesis 429
- electrodes 422
- modification 425
 - standard hydrogen 422
- electrolytes 421
- hydrophobic 426
- electron transfer
- photo-induced 409
- electron-withdrawing groups 451
- electroreduction 428
- CO_2 428
- "electrostriction" 325
- elimination
- water 462
- ELP, *see* expanded liquid phases
- emulsion polymerization 157
- emulsions
- applications 174
 - biphasic reactions 172
 - inverse 172
 - ionic liquid-in-SCF 173
 - microemulsions 174
 - SCF-in-water 173
- enantioselectivity 216
- acetylation 290
 - acylation 233
 - cyclopropanations 217
 - enzymes 290
 - hydrogenation 138
 - photoisomerization 227
- end-points
- upper/lower critical 89, 92
- energy
- Gibbs free 306
 - intermolecular potential 307
 - surface 308
- engineering
- process and production 32
- enhanced fluidity liquids (EFL) 103

- entrapment
 - enzymes 292
 - entropy change– mixing 308
 - environmental benefit– SCF 189
 - enzymatic catalysis 281
 - enzymatic
 - IL-scCO₂ biphasic systems 294
 - near-critical/supercritical fluids 284
 - SCF 283
 - enzymatic esterification 171
 - enzymatic reactions 285
 - deactivation processes 291
 - enzymes
 - alkaline phosphatase 230
 - artificial 338
 - carboxylation of pyrrole 234
 - coating 292
 - cross-linked crystals 293
 - cutinase 291
 - enantioselectivity 290
 - entrapment 292
 - esterases 285
 - lipases 282, 285, 286, 291
 - non-aqueous environments 281
 - reactors 287, 288, 296
 - stabilized 292
 - epoxidation
 - sharpless 207
 - equilibrium
 - vapor–liquid 105
 - equilibrium reactions 121
 - era of polymers 303
 - esterases 285
 - esterification 232
 - enzymatic 171
 - esters 460
 - ethane 108, 350, 460
 - octacosane–ethane system 90
 - ethanol
 - interfacial tension 113
 - volumetric expansion 105
 - ethers 11, 461
 - diethyl 105
 - ethylbenzene 72
 - ethylcyclohexane 72
 - ethylene 108
 - ethylene glycol 450
 - EtOAc 105
 - evaporation 66
 - expanded liquid phases (ELP) 101, 102
 - density 109
 - diffusivity 114
 - gas solubility 118
 - hydrogenation reactions 135
 - interfacial tension 112
 - melting point 111
 - oxidation reactions 143
 - polarity 115
 - viscosity 110
 - expansion
 - volumetric 105–107
 - explosion prevention
 - oxygen-containing systems 142
 - extraction
 - in SCFs 452
 - extractive phase 295
- f**
- fats
 - valorization 285
 - fatty acids 23
 - ferrocene 420, 427
 - ferroelectric materials 325
 - films
 - amorphous 391
 - fine chemicals
 - high-value 9
 - Fischer–Tropsch synthesis 254, 260
 - fittings 45
 - National Pipe Thread 41
 - tube 47
 - fixation
 - chemical 339
 - fixed-bed reactor 259
 - flammable compounds 60
 - flammable SCFs 189
 - Flory–Huggins interaction parameter 311
 - flow controller
 - mass 61, 65
 - flow-through scH₂O method 380
 - flowmeter
 - variable-area 66
 - fluctuations
 - density 247
 - fluidity
 - enhanced fluidity liquids (EFL) 103
 - pure 81
 - supercritical fluids 1
 - thermophysical properties 59
 - tunable 130
 - fluorides
 - poly(vinylidene fluoride) 324
 - fluorinated solids 134
 - fluorinated solvents 325
 - fluorinated surfactants 375
 - fluoroform 93
 - fluoroolefin polymers 319
 - fluoropolymers

- side-chain 317
 - Fourier transform (FT) IR measurements 56
 - free enzymes
 - coating 292
 - free-radical bromination 410
 - free-radical carbonylation 229
 - free-radical chlorination–alkanes 411
 - Friedel–Crafts acylation 420, 435, 442
 - Friedel–Crafts chemistry 442
 - fructose 466
 - FTIR, *see* Fourier transform (FT) IR measurements
 - fumehood 33, 71
 - functional groups
 - acid-sensitive 222
 - functionality
 - chemical 94
 - molecular 399
 - functionalization 334
 - alkanes 411
 - amidine-functionalized phosphine ligand 128
 - anthraquinones 258
 - carbon nanotubes 390
- g**
- gas chromatography (GC) 54
 - gas-expanded liquids (GXLs) 101, 103, 243
 - conversions in 271
 - heterogeneous catalysis 244
 - “gas-like” properties 54
 - gas shift reaction
 - reverse water 257
 - gas solubility
 - expanded liquid phases 118
 - gas supply 445
 - gases
 - biomass conversion 468
 - chemisorption 120
 - compressed 5, 101
 - depressurized streams 66
 - discharging devices 34
 - dosage 58
 - greenhouse 214
 - head-gas 4
 - ideal 93, 307
 - gasification
 - biomass 470
 - geminate caged radical pairs 407
 - general reactor design 41
 - in situ* generation
 - acids 120
 - geometric isomerization 403
 - Geotrichum candidum* 289
 - germanium nanoparticles 372
 - Gibbs free energy 306
 - glasses– controlled pore 249
 - glucose 466
 - glycerol 462
 - glycine decomposition
 - hydrothermal 468
 - glycol
 - ethylene 450
 - gold nanocrystals 371
 - molecularly tethered 372
 - gravimetric dosage 60
 - green chemistry
 - 12 principles 243
 - green enzyme reactor
 - continuous 296
 - greenhouse gas emission 7
 - groups
 - acetal 451
 - electron-withdrawing 451
 - functional 222
 - Grubbs catalysts
 - alkene metathesis 148
 - ruthenium-based 346
 - GXLs
 - gas-expanded liquids 243
- h**
- Haber–Bosch process 20, 243
 - Hammett correlation 451
 - Harkin model 339
 - hazards
 - organic solvents 109
 - SCFs 5
 - head-gas 4
 - head-to-tail dimmers 404
 - heat transfer effects 245
 - heated solvents– reactor cleaning 58
 - heating
 - reactor 109
 - Heck reactions 209
 - coupling 211
 - Pd-catalyzed 127
 - Henry reaction 219
 - Henry's law 102, 104
 - heterogeneous
 - catalysis 18, 243, 244
 - catalyst poisoning 472
 - conversions 252
 - polymerizations 310
 - heterogenized catalyst systems 141
 - 2-hexanone 162
 - high-pressure liquid chromatography 69
 - high-pressure methods and equipment 31

- high-pressure NMR investigations 42
 - high-pressure reactors 452
 - windows 400
 - high-pressure regime
 - dosage of gases 58
 - high-pressure stirred tank reactor 288
 - high-pressure systems
 - phase behavior 86
 - high-value fine chemicals 9
 - highly fluorinated solids 134
 - Hildebrand parameter 3, 284
 - history
 - SCFs 9
 - homogeneous hydrogenation 136, 170
 - homogeneous mixture
 - isotropic 307
 - homogeneous oxidation
 - cyclohexane 144
 - homopolymers
 - perfluorinated 324
 - HPLC. *see* high-pressure liquid chromatography
 - hydrations 460
 - hydroaminomethylation 123
 - rhodium-catalyzed 204
 - hydrocarbons
 - cracking 270
 - para-critical 14
 - hydrodynamic coil expansion factor 310
 - hydrofluorocarbon supercritical solvents 426
 - hydroformylation 202, 254, 262
 - asymmetric 204
 - continuous flow 172
 - 1-octene 139, 141
 - hydrogen
 - abstractions 413
 - active 469
 - bonding 117, 439
 - solubility 272
 - standard electrode 422
 - hydrogenation 190, 253
 - asymmetric 138, 198
 - enantioselective 138
 - expanded liquid phases 135
 - heterogeneous catalysis 256
 - homogeneous 136, 170
 - selective 198
 - solventless 136, 137
 - supercritical reactor 71
 - hydrolysis 460
 - hydrophilic dye 132
 - hydrophobicity
 - electrolytes 426
 - surface 265
 - hydrothermal glycine decomposition 468
 - hydrothermal synthesis 377, 380
 - hydrothermal synthesis–supercritical 377
 - hydrothermal upgrading 469
 - hydroxy acids
 - dimeric 351
- i*
- ideal gas 93, 307
 - IL. *see* ionic liquids
 - imidazolium IL–scCO₂ mixtures 127
 - imidization reaction 339
 - imines 201
 - immiscibility
 - unintentional 151
 - immobilization
 - catalysts 263
 - 1,3-regiospecific lipase 291
 - “immortal” polymerization 332
 - imprinting
 - molecular 338
 - in situ* generation
 - acids 120
 - indole derivatives 94
 - induced phase change 112
 - industrial applications
 - SCFs 16, 58
 - industrial production
 - 2-propanol 151
 - infrared 56
 - inline IR measurements 56
 - inorganic compounds
 - in NCW and scH₂O 471
 - inorganic–inorganic nanocomposites 393
 - inorganic oxide–polymer hybrids 387
 - inorganic salts 390
 - inorganic SCF 85
 - interfacial tension
 - expanded liquid phases 112
 - intermolecular potential energy 307
 - inverse emulsions
 - water-in-SCF 172
 - iodobenzene 453
 - ionic chain polymerizations 346
 - ionic liquids (IL) 106, 293, 294
 - crystallization of solutes 130
 - IL–scCO₂ biphasic systems 294
 - IL-in-SCF emulsions 173
 - IL–SCF biphasic systems 163
 - imidazolium 115, 164
 - supported ionic liquid phase 140
 - water-immiscible 294
 - IR measurements 56, 126
 - irregular-shaped particles 351

- isoalkanes 262
 - isomerization 256, 269
 - geometric 403
 - photo- 227
 - isomers
 - *ortho*- 445
 - isophorone 193
 - isopropoxide
 - titanium 381
 - isotherm
 - adsorption 388
 - solubility 97
 - isotropic homogeneous mixture 307
- j**
- Joule–Thomson effect 67
- k**
- ketal formation 451
 - ketones 202, 208
 - kinetic products
 - removal 156
 - kinetic resolution
 - dynamic 297
- l**
- laboratory meters 66
 - laurate
 - vinyl 296
 - laws and equations
 - Gibbs free energy 306
 - Henry's law 102, 104
 - law of corresponding states 1
 - partial molar volume 248
 - Stokes–Einstein equation 408
 - van der Waals equation 87
 - virial equation 61
 - LCEP, *see* lower critical end-points
 - levulinic acid 195
 - lifetime/stability enhancement 250
 - ligands
 - organic capping 373
 - phosphine 128
 - light organic solvents 109
 - lignin 467
 - limonene 135, 192
 - lipase-catalyzed reactions 282, 286
 - alcoholysis 284
 - lipases 282, 285
 - 1,3-regiospecific 291
 - lipophilic phase transfer catalysts 437
 - liquefaction
 - CO₂-induced 137
 - liquefaction point 120
 - liquid–liquid demixing line 321
 - liquid organic solvents 251
 - liquid polymers 167
 - CO₂-expanded 118, 119
 - liquid–SCF biphasic systems 101, 159
 - ionic 163
 - liquid–vapor coexistence curve 77
 - liquids
 - chemisorption 120
 - CO₂-expanded 103
 - compressed 375
 - dosage 62
 - enhanced fluidity liquids (EFL) 103
 - expanded liquid phases (ELP) 102
 - gas-expanded 101, 243
 - gas-expanded liquids 101
 - ionic 104, 111
 - ionic liquids 293
 - non-volatile 160
 - polymers 106
 - LOC values 60
 - local density augmentation 3
 - low critical temperatures 84, 425
 - low-polarity organic compounds 55
 - lower critical end-points (UCEP) 89, 92
 - Lurgi technology 21
- m**
- macromolecular chemistry 304
 - macromolecules
 - solubility 306
 - magnetic drive
 - packless 52
 - maleic anhydride 193
 - manometer 47
 - mass and heat transfer effects 245
 - mass flow controller (MFC) 61
 - mass flow meter 62
 - materials
 - sealing 39
 - templated 158
 - “MegaMethanol” 21
 - melting point
 - depression 90, 137
 - expanded liquid phases 111
 - naphthalene 112
 - “memory” phenomenon 283
 - meniscus 2
 - mesoporous catalysts 248
 - mesoporous silica 391
 - metal catalysts
 - cobalt 142
 - palladium 127
 - rhodium catalysts 128

- supported noble metal catalysts 258
 - metal-catalyzed polymerizations 340
 - metal-catalyzed processes 214
 - metal complexes
 - Schiff base-type 344
 - solid-supported 200
 - metal nanocrystals 369
 - metal oxide nanoparticles 377
 - metal–polymer composites 386
 - metallocene catalysts 340
 - metathesis
 - alkene 148
 - ring-closing 215
 - metathetical polymerization
 - ring-opening 345
 - metering pumps 63
 - Methyl Yellow 452
 - MFC. *see* mass flow controller
 - micelles
 - reverse 375
 - microemulsions
 - SCF-based 374
 - water-in-CO₂ 426
 - water-in-oil 376
 - microstructured reactors (MSRs) 45
 - migration
 - double bond 210
 - miscibility
 - tunable 134
 - mixing entropy change 308
 - mixtures
 - asymmetric binary 88
 - critical line 88
 - isotropic homogeneous 307
 - model
 - Harkin 339
 - Noyes 412
 - modulus
 - Thiele 270
 - Young's 332, 387
 - molar volume
 - partial 248
 - molecular bromine 411
 - molecular functionality 399
 - molecular imprinting 338
 - molecular sieves
 - carbon 391
 - molecularly tethered gold nanocrystals 372
 - monochlorides 413
 - monodisperse nanoparticles 376
 - monolayer coating 392
 - monomers
 - bifunctional 334
 - vinyl 335, 336
 - monophos complexes 201
 - montmorillonite 334
 - sodium 331
 - Mucor miehei* 291
 - multicatalytic processes 296
 - multicomponent systems 245
 - multienzymatic processes 298
 - multiphase
 - compressed gases 101
 - multiwalled carbon nanotubes (MWNT) 383, 384
- n**
- nanocages
 - carbon 385
 - nanocomposites 385
 - inorganic–inorganic 393
 - nanocrystals 369
 - ceria 379
 - nanomaterials 369, 383
 - nanoparticles
 - decoration on nanotubes 388
 - deposition on porous supports 391
 - metal oxide 377
 - monodisperse 376
 - palladium 205
 - platinum 392
 - recovery 377
 - surface energy 378
 - nanoreactors 376
 - nanotubes
 - carbon 383
 - multiwalled 383, 384
 - nanowires 372, 373
 - naphthalene 93
 - hydrogenation 197
 - melting point 112
 - α -naphthyl acetate 408
 - National Pipe Thread fittings 41
 - natural carbonic acid
 - scCO₂ 9
 - natural clays 391, 393
 - NCW. *see* near-critical water
 - near-critical region 2, 14, 243
 - near-critical water (NCW) 438
 - chemistry in 457
 - dielectric constant 440
 - Friedel–Crafts chemistry 442
 - inorganic compounds 471
 - synthesis 459
 - neoteric solvents 284
 - nitrile 460
 - nitroarenes 122

- nitrobenzene
 - volumetric expansion 105
- NMR investigations
 - high-pressure 42
- noble metal catalysts 264
 - supported 258
- non-steroidal anti-inflammatory drug 138
- non-volatile liquids 160
- nonanal 139
- norbornene 345
- Norrish type I photo-cleavage 405
- Novozym 230
- Noyes model 412
- NSCW
 - near-critical water, scH_2O 457
- nucleation 329
- nucleophilicity 348
- o**
- O-ring seal design 41
- octacosane–ethane system 90
- oils
 - biomass conversion 468
 - edible 23
 - valorization 285
 - water-in-oil microemulsions 376
- olefins
 - fluoroolefin polymers 319
 - perfluoroolefin copolymers 324
 - polyolefins 340
- on-line electrochemical detection 430
- opalescence
 - critical 247
- optical windows 53
- optimization
 - self- 48
- organic capping ligands 373
- organic chemistry
 - synthetic 189
- organic compounds
 - low-polarity 55
 - unsaturated 257
- organic salts
 - CO_2 -induced liquefaction 137
- organic SCF 86
- organic solvent mixtures
 - phase behavior 133
- organic solvents
 - hazardous 109
 - light 109
 - liquid 251
 - reactor cleaning 57
 - supercritical 371
- organic synthesis
 - solid-phase 142
- organometallic reactions 465
- ortho*-isomer 445
- orthosilicate
 - tetraethyl 387
- overoxidized products 263
- overpressure
 - peak 32
- oxidation 205, 254
 - Baeyer–Villiger 208
 - expanded liquid phases 143
 - heterogeneous catalysis 263
 - homogeneous 144
 - partial 272, 464
 - photo- 410
 - radical 145
 - scH_2O 22, 470
 - Wacker 213
- oxide–polymer hybrids
 - inorganic 387
- oxybromination
 - *o*-cresol 122
- oxyfunctionalization 265
- oxygen-containing systems
 - explosion prevention 59
- p**
- packed-bed enzyme reactor 288
- packless magnetic drive 52
- palladium-catalyzed Heck reactions 127
- palladium-mediated coupling reactions 208
- palladium nanoparticles 205
- para-critical, (i.e. near-critical) hydrocarbons 14
- partial molar volume 314
- partial oxidation 272, 464
- particle agglomeration 311
- particle formation, in NCW and scH_2O 471
- partition coefficients 162, 284
- Pauson–Khand carbonylations 142
- Pauson–Khand reaction 214
- PDMS, cross-linked 170
- PE, *see* polyethylene
- peak overpressure 32
- PEG, *see* poly(ethylene glycol)
- pentablock copolymers, branched 350
- n*-pentane
 - diffusivity 249
- perfluorinated homopolymers 324
- perfluorinated surfactants 341
- perfluoroolefin copolymers 324
- peroxocarbonic acid 147
- Perspex 326
- PFRs, *see* plug flow reactors

- PGSS process 14
- phase behavior
 - biphasic systems 102
 - IL-scCO₂ biphasic systems 295
 - organic solvent mixtures 133
 - SCF 96
 - water–SCF mixtures 161
- phase change, induced 112
- phase diagrams
 - binary 86
 - CO₂ 2
 - five classes 88
 - pure substances 78
- phase separation, tunable 131
- phase transfer catalysis (PTC) 435, 437
 - lipophilic catalysis 437
 - separation and recycling 437
- phase transfer reactions 435
- phenol 443, 448
 - 4-tertbutyl phenol 198
- 2-phenylethanol 171
- Phillips catalysts 340
- phosphatase, alkaline 230
- phosphine ligand, amidine-functionalized 128
- photoaddition 225
- photochemical reactions 224, 399
- photochemistry, carbonyl 405
- photocleavage, Norrish Type I 405
- photodimerization 403
- photoinduced reactions 399
 - electron transfer 409
 - radical chain reactions 410
- photoinitiator 316
- photoisomerization 227
- photooxidation 410
- photosensitization 409
- physical properties
 - CO₂ 306
 - SCFs 7, 77
- physical strains 34
- physicochemical properties, water 457
- picrate, tetrabutylammonium 437, 438
- piezoelectric polymers 322
- pinacol–pinacolone rearrangement 463
- pinene 191
- platform chemicals 465
- platinum nanoparticles 392
- Plexiglas 326
- plug flow reactors (PFRs) 45, 51
- plugging, salt 472
- PMMA, *see* poly(methyl methacrylate)
- poising, heterogeneous catalysis 472
- polar SCFs 424
- polar solids 93
- polar substrates, complexation 285
- polarity
 - expanded liquid phases 115
 - relative 117
- polarity–composition diagram 115
- polarity parameter 116
- polyacrylates 309
- polyacrylonitrile 313
- polycaprolactone 348
- polycarbonates, aliphatic 342
- polychlorides 413
- polycondensation reactions 314
- polydispersity 332
- polyesters, caprolactone-based 350
- poly(ethylene glycol) (PEG) 297
 - PEG-stabilized Pd nanoparticles 205
- polyethylene (PE) 340
- poly(glycolic acid) 351
- poly(hydroxy ester)s 350
- polyketones 344
- poly(L-lactic acid) 351
- polymer-based nanocomposites 386
- polymer–SCF biphasic systems 170
- polymerization
 - cationic 346
 - “controlled” radical 316, 331
 - coordinative anionic 348
 - dispersion 310, 320
 - emulsion 157
 - heterogeneous 310
 - “immortal” 332
 - in scCO₂ 303, 315
 - ionic chain 346
 - metal-catalyzed 340, 342
 - radical 315
 - radical-initiated 126
 - ring-opening metathetical 345
- polymers
 - amphiphatic 318
 - copolymers 324
 - fluoro- 317
 - fluoroolefin 319
 - inorganic oxide–polymer hybrids 387
 - liquid 106, 160, 168
 - metal–polymer composites 386
 - π -conjugated backbone 345
 - piezoelectric 322
 - polymer–polymer composites 386
 - semicrystalline thermoplastic 322
 - solubility 168
- poly(methyl methacrylate) (PMMA) 326
- polyolefins 340
- polypropylene (PP) 340
- polystyrene (PS) 332

- polytetrafluoroethylene (PTFE) 319
- poly(vinyl chloride) (PVC) 335
- poly(vinylidene fluoride) 322, 335
- poppet 65
- pore effectiveness factor 250
- porous solids 244, 246
- porous supports, deposition of
 - nanoparticles 391
- porphyrin-type catalyst 343
- post-reaction separation 152
- potential energy, intermolecular 307
- potential windows 419
- powder morphology 323
- precipitation
 - salts 472
 - tunable 131
- precipitation polymerization 310
- pressure
 - adjustment 61
 - critical 1
 - crossover 97
 - density-pressure plane 78
 - electrochemistry 424
 - reactors 65
 - reduced 1
 - supercritical biocatalysis 289
 - supply 64
- pressure effects 96
- pressure regulator
 - back- 69, 72, 166
- pressure relief valves (PRVs) 53, 402
- pressure sensors 47, 49
- pressure transmitters 47
- pressure vessels 5, 41
- 12 principles of green chemistry 243
- process and production engineering 32
- processes
 - acid-catalyzed 219
 - aqueous (phase) reforming 470
 - base-catalyzed 218
 - batch processes 60
 - biomass conversion 465
 - continuous flow 61, 154, 166
 - design 24, 77
 - enzyme deactivation 291
 - Haber-Bosch 20, 243
 - hydrothermal upgrading 469
 - metal-catalyzed 214
 - multi-enzymatic 298
 - multicycatalytic 296
 - PGSS 14
 - RESS 14
 - sequential reaction-separation 130
 - slurry-phase 260
 - SSEC 382
 - product/catalyst separation 154
 - propagation constants 317
 - 2-propanol
 - industrial production 151
 - propanol
 - volumetric expansion 105
 - propargylic alcohols 205
 - propene
 - hydrogenation 190
 - protection strategies
 - temporary 120
 - proteins 467
 - protonation 125
 - PS, *see* polystyrene
 - pseudo-first-order rate constants 444, 447, 452
 - PTC, *see* phase transfer catalysis
 - PTFE, *see* polytetrafluoroethylene
 - pumps
 - metering 63
 - pure fluids
 - viscosity 81
 - pure substances
 - phase diagram 78
 - PVC, *see* poly(vinyl chloride)
 - pyrolysis 469
 - pyrone formation 214
 - pyrrole 234

q

 - quadrupole moment
 - CO₂ 83
 - quasi-reference electrodes (QREs) 423

r

 - radical chain reactions
 - photo-induced 410
 - radical-initiated polymerization
 - styrene 126
 - radical oxidation
 - steel-promoted 145
 - radical polymerization 315
 - radical reactions 228
 - transfer 316
 - radicals
 - caged pairs 407
 - free-radical 407
 - rate constants
 - pseudo-first order 444, 447, 452
 - rate enhancement 247, 251
 - raw materials
 - renewable 467
 - reaction-separation processes

- sequential 130
- reactions
- acetylation 290
- acid-catalyzed 435
- acylation 233
- alkylation 255, 266
- alkylcarbonic acids 451
- amination 210
- ammonium salt-catalyzed 436
- asymmetric hydrogenation 198
- Aufbau 14
- Baylis-Hillman 211
- biphasic 172
- Cannizzaro 459, 473
- carbonylation 139
- carboxylation 234
- chlorination 403
- condensation 66, 462
- coupling 208, 435
- crystallization 130
- cycloaddition 142, 221
- cyclopropanation 217
- dehydration 461
- dehydrogenation 253, 260
- denitrogenation 225
- Diels-Alder 221, 463
- dimerization 404
- disproportionation 268
- electrochemical-electrochemical 419
- electroreduction 428
- enzymatic 285
- enzymatic esterification 171
- equilibrium 121
- esterification 232
- Fischer-Tropsch synthesis 254, 260
- free radical bromination 410
- free radical chlorination 411
- Friedel-Crafts acylation 435
- Friedel-Crafts alkylation 220, 442
- geometric isomerization 403
- glycine decomposition 468
- Heck 127, 209
- Henry 219
- hydration 157
- hydroaminomethylation 123, 204
- hydroformylation 139, 141, 172, 254, 262
- hydrogen abstraction 413
- hydrogenation 135
- hydrolysis 460
- imidization 339
- in SCFs 4, 16
- isomerization 256, 269
- lipase-catalyzed 282, 286
- metathesis 148
- nucleation 329
- organometallic 465
- oxidation 205
- oxybromination 122
- Pauson-Khand 209, 214
- phase transfer 435
- photochemical 224, 399
- photodimerization 403
- photoinduced 399, 409
- photosensitization 409
- polycondensation 314
- polymerization 303
- post-reaction separation 152
- precipitation 130
- protonation 125
- radical 228, 316, 410
- rearrangements 463
- reverse water gas shift 257
- ring-closing metathesis 235
- sharpless epoxidation 207
- supercritical biocatalysis 289
- Suzuki 209
- transesterification 231
- tunable phase separation 131
- tunable precipitation/crystallization 130
- reactive ketones 202
- reactors
- chemoenzymatic 297
- cleaning 57, 69
- continuous flow 44
- continuous green enzyme 296
- continuously stirred tank reactors 45
- design 41, 251
- enzyme 287
- fixed-bed 259
- heating 48
- high-pressure 34, 42
- hydroformylation 202
- microstructured 45
- nano- 376
- packed-bed enzyme 288
- plug flow 45, 51
- pressure 65
- scCO_2 401
- stirred tank reactor 41
- supercritical hydrogenation 70
- rearrangements 463
- reciprocating compressors 34
- reciprocating pumps 63
- recirculation 288
- recovery of nanoparticles 377
- recycling
- PTC 437
- reduced pressure/temperature 1

- reduction
 - colloid-catalyzed 163
 - in NCW and scH_2O 464
 - reference electrode 422
 - quasi- 422
 - reforming
 - aqueous (phase) 470
 - regioisomers 139
 - regioselectivity
 - enzymatic catalysis 281
 - 1,3-regiospecific lipase
 - immobilized 291
 - relative polarity 117
 - relative volume expansion 107
 - renewable raw materials 347, 467
 - resistance temperature detectors 48
 - RESS process 14
 - reverse micelles 375, 377
 - reverse water gas shift (RWGS) reaction 257
 - rhodium catalysts 122, 263
 - ring-closing metathesis 215
 - ring-opening metathetical polymerization (ROMP) 345
 - ring systems
 - aromatic 442
 - ROMP, *see* ring-opening metathetical polymerization
 - rupture disk 401
 - ruthenium-based Grubbs-type catalysts 346
- S**
- sacrificial aldehyde 206
 - sacrificial co-reductant 145
 - safety valves 53
 - safety warnings 58
 - salts
 - ammonium 436
 - diazonium 452
 - inorganic 390
 - organic 137
 - plugging 472
 - unwanted precipitation 472
 - sapphire 44
 - scCO_2 4, 7
 - diffusibility 58
 - electrochemical reactions 424
 - free radical brominations 410
 - IL- scCO_2 biphasic systems 294
 - imidazolium IL- scCO_2 mixtures 165
 - nanomaterials synthesis 370
 - polymerization in 303
 - polymerization in 315
 - reactor 401
 - water-in- scCO_2 microemulsions 375, 382
 - SCF, *see* supercritical fluids
 - SCF-in-water emulsions 173
 - Schiff base-type metal complexes 344
 - scH_2O (SCW) 7, 85
 - chemistry in 457
 - flow-through method 380
 - inorganic compounds 471
 - nanomaterials synthesis 373
 - oxidation 22, 470
 - synthesis 459
 - water-in- scCO_2 microemulsions 375, 382
 - SCWO, *see* supercritical water oxidation
 - sealing materials 35, 39, 41
 - secondary amines 124
 - seed to enhance crystallization (SSEC) process 382
 - selectivity
 - benzaldehyde 264
 - control 135
 - dehydration 467
 - hydrogenation 198
 - shape-selectivity effects 267
 - tuning 248
 - self-diffusivity
 - CO_2 79, 80
 - self-optimization 48
 - semiconductor nanocrystals 369
 - semicrystalline thermoplastic polymer 322
 - sensitizers 227
 - chiral 409
 - photo- 409
 - sensors
 - pressure 48, 49
 - separation 435
 - post-reaction 152
 - product/catalyst 154
 - ^{13}C 437
 - sequential reaction–separation processes 130
 - shape-selectivity effects 267
 - sharpless epoxidation 207
 - shift reaction
 - reverse water gas 257
 - shut-off devices 33
 - side-chain fluoropolymers 317
 - sieves
 - molecular 391
 - silica
 - mesoporous 391
 - silicon nanoparticles 371
 - siloxane-based stabilizers 329
 - SILP, *see* supported ionic liquid phase
 - silver nanocrystals 370
 - six-component mixture 140
 - six-port valve 54

- slurry-phase process 260
- sodium montmorillonite 331
- sol-gel synthesis
 - direct 380
- solid acids 149
- solid-phase organic synthesis (SPOS) 142
- solid supports 200, 292
- solids
 - dosage 64
 - fluorinated 134
 - polar 93
 - porous 244, 246
- solubility
 - biphasic systems 102, 104
 - experimental data 305
 - gases 118
 - hydrogen 272
 - isotherm 97
 - macromolecules 306
 - polymers 168
 - SCF 92
 - structure-solubility relationship 95
 - temperature and pressure effects 96
- solutes
 - chemical functionality 94
 - clustering 8
 - clustering 400
 - crystallization 130
 - diffusivity 307
- solution temperature
 - upper critical 442
- solvating power
 - adjustable 8
- solventless continuous flow
 - hydroformylation 172
- solventless hydrogenation
 - cinnamaldehyde 136
- solvents
 - chlorinated 58
 - density 304
 - electrochemical reactions 423
 - fluorinated 325
 - hazardous organic 109
 - heated 58
 - light organic 109
 - liquid organic 251
 - neoteric 284
 - organic 57
 - organic solvent mixtures 133
 - relative volume expansion 107
 - SCF 92, 399
 - SCF discovery 9
 - selection 159
 - solvent-solute clustering 399
 - supercritical 426
 - supercritical organic 371
 - switchable 124
 - tunable 4
 - viscosity 399
 - volumetric expansion 107
- sound level 32
- stability enhancement 250
- stabilization
 - catalysts 155
 - steric 311, 313, 371
- stabilized enzymes 292
- stabilizers
 - design 310
 - for CO₂ 314
 - siloxane-based 329
- standard hydrogen electrode 422
- statistical distribution of products 406
- steel-promoted radical oxidation 145
- stereoselectivity- enzymatic catalysis 281
- steric stabilization 311, 313, 371
- stirred tank reactor (STR) 41
 - continuously 45
 - high-pressure 288
- stirrer types 51
- Stokes-Einstein equation 408
- storage vessel 61
- streams
 - depressurized gas 66
- stress corrosion cracking 35
- structure-solubility relationship 95
- styrene
 - asymmetric hydroformylation 204
 - homogeneous hydrogenation 170
 - radical-initiated polymerization 126
- substituents
 - damping effect 95
- substrates
 - polar 285
- sulfosuccinate
 - bis(2-ethylhexyl) 374, 375
- sulfoxide
 - dimethyl 435
- supercritical alkanes 371, 374
- supercritical biocatalysis 289, 292
- supercritical butene 154
- supercritical CO₂, *see* scCO₂
- supercritical difluoromethane 427
- supercritical flow reactors
 - automated 69
- supercritical fluids (SCF) 1
 - aqueous-SCF biphasic systems 159
 - biotransformations 229
 - biphasic systems 101, 159, 163

- chromatography in 452
 - conversions in 256
 - delivery system 421
 - density 3
 - environmental benefit 189
 - enzymatic catalysis 283
 - extraction in 14
 - hazards 5
 - history and applications of 9
 - industrial applications 16, 20
 - inorganic 85
 - ionic liquid-in-SCF emulsions 173
 - macromolecular chemistry 304
 - microemulsions 374
 - nanomaterials synthesis 370
 - organic 86
 - phase behavior 86
 - photochemical and photo-induced reactions 399
 - physical properties 7, 77
 - polar 424
 - polymer-SCF biphasic systems 167
 - reactions 4, 16
 - solubility 92
 - solvents 92, 399
 - synthetic organic chemistry 189
 - thermophysical properties 375
 - viscosity 413
 - water-in-SCF inverse emulsions 172
 - water-SCF mixtures 161
 - supercritical hydrogenation reactor 70
 - supercritical hydrothermal synthesis 377
 - supercritical organic solvents 371
 - supercritical solvents
 - hydrofluorocarbon 426
 - supercritical water oxidation (SCWO) 22, 470
 - supercritical water (SCW). *see* scH_2O
 - supply pressure 138
 - supported ionic liquid phase (SILP) 140
 - supported noble metal catalysts 258
 - supports
 - porous 391
 - solid 292
 - surface area-to-volume ratio 44
 - surface energy
 - nanoparticles 378
 - surface-functionalized particles 334
 - surface hydrophobicity 265
 - surface phase
 - catalyst-rich 436
 - surfactants
 - AOT 374, 375
 - fluorinated 375
 - perfluorinated 341
 - Suzuki reactions 209
 - swelling 252
 - switchable solvents 124
 - synthesis
 - ammonia 20
 - chemisorption of gases in liquids 120
 - direct sol-gel 380
 - electrochemical 429
 - Fischer-Tropsch 254, 260
 - hydrothermal 377
 - in NCW and scH_2O 459
 - nanomaterials 369
 - SCFs in 6
 - solid-phase organic 142
 - supercritical hydrothermal 377
 - synthetic organic chemistry in SCF 189
 - syringe pumps 63
- t**
- tank reactors
 - stirred tank reactor 288
 - TBAP, *see* tetrabutylammonium picrate
 - Teflon FEP 321
 - temperature
 - critical 1
 - detectors 48
 - electrochemistry 424
 - low critical 62
 - reduced 1
 - supercritical biocatalysis 289
 - upper critical solution 442
 - temperature effects 96
 - templated materials 158
 - temporary protection strategies 120
 - tensile strength 46
 - tension- interfacial 12
 - 4-tertbutyl phenol 198
 - tertiary amines 124
 - tethered gold nanocrystals
 - molecularly 372
 - tetrabutylammonium picrate (TBAP) 437, 438
 - tetrabutylammonium tetrafluoroborate (TBABF₄) 421, 427, 428
 - tetraethyl orthosilicate (TEOS) 387
 - tetrafluoroborate
 - tetrabutylammonium 421, 427, 428
 - thermal Brownian movement 312
 - thermal conductivity 84
 - CO₂ 84
 - thermal mass flow meter 62
 - thermocouples 48
 - thermophysical properties
 - compressed liquids and SCF 375
 - fluid systems 59

- thermoplastic polymer
 - semicrystalline 322
 - Thiele modulus 270
 - tiglic acid 1, 138
 - titanium alkoxides 381
 - titanium isopropoxide (TIP) 381
 - toluene
 - volumetric expansion 104
 - toroidal design 43
 - total reflection mode
 - attenuated 56
 - total volume measurement 66
 - toxicity
 - SCFs 5
 - transesterification 231
 - transfer catalysis
 - phase transfer catalysis 435
 - transfer effects
 - mass and heat 245
 - transfer reactions
 - phase 435
 - radical 316
 - trifluoride
 - boron 347
 - triple point 247
 - tube fittings 47
 - tubes 45
 - tunable
 - crystallization 130
 - fluids 435
 - miscibility 134
 - phase separation 131
 - precipitation 130
 - solvents 4
- u**
- UCEP, *see* upper critical end-points
 - UCST, *see* upper critical solution temperature
 - unintentional immiscibility 151
 - units, dosing 62
 - unsaturated organic compounds 257
 - unwanted salt precipitation 472
 - upgrading, hydrothermal 469
 - upper critical end-points (UCEP) 89
 - upper critical solution temperature (UCST) 92, 442
- v**
- valorization, oils and fats 285
 - valves 47
 - pressure relief 33, 53
 - safety 53
 - six-port 54
 - van der Waals equation 87
 - van der Waals potential 313
 - vapor
 - liquid–vapor coexistence curve 77
 - vapor–liquid equilibrium 105
 - variable-area flowmeter 66
 - variable-volume view cells 42
 - vegetable resources, renewable 348
 - vessels
 - pressure 41
 - pressurized 5
 - storage 61
 - view cells, variable-volume 42
 - vinyl acetate 338
 - vinyl carbamate 219
 - vinyl laurate 296
 - vinyl monomers 335, 336
 - virial coefficient 310
 - virial equation 61
 - viscosity 79
 - CO₂ 81
 - expanded liquid phases 110
 - pure fluids 81
 - SCF 7, 413
 - solvents 399
 - VLE, vapor 105
 - voltammetry 419, 427
 - volume
 - expansion 272
 - partial molar 248
 - surface area-to volume ratio 44
 - total 66
 - volumetric expansion 104, 106
 - CO₂ dissolution 168
 - solvents 107
- w**
- Wacker oxidation 213
 - water
 - aqueous–SCF biphasic systems 159
 - density 439, 440
 - dielectric constant 82, 83, 440
 - dissociation constant 441
 - elimination from glycerol 462
 - near-critical 438
 - physicochemical properties 457
 - reverse water gas shift reaction 257
 - SCF-in-water emulsions 173
 - supercritical, sCH₂O 7
 - supercritical oxidation 22, 470
 - usage 438
 - volumetric expansion 104
 - water-immiscible ILs 294
 - water-in-CO₂ microemulsions 426
 - water-in-oil microemulsions 376

– water-in-SCF inverse emulsions 172
water–SCF mixtures, phase behavior 161
wet meters 66
Wilkinson's catalyst, homogeneous
 hydrogenation 170
windows
– high-pressure reaction vessels 400
– optical 53
working electrode 422
working phase 295

x
xanthene 266

y
Young's modulus 332, 387

z
zeolite catalysts 266
Ziegler–Natta catalysts 340
zinc complexes 343

Index

a

- AAC2 mechanism 349
 Abraham–Kamlett–Taft (AKT) model 253
 absorbents, super- 78
 absorption, selective 278
 acceleration, hydrophobic 17, 18
 acceptor number 246
 2-acetamidoacrylic acid 118
 acetate, ammonium 356
 acetophenones 276
 – benchmark substrate 129, 130
 achiral hydrogenation 109, 124–126
 achiral water-soluble ligands 107
 acids 315, 378
 – 2-acetamidoacrylic 118
 – acid–base equilibrium 139, 140
 – acid-facilitated equilibration 121
 – acrylic 301
 – amino, *see* amino acids
 – 6-aminopenicillanic 371, 372
 – benzoic 347, 353
 – Brønsted, *see* Brønsted acids
 – camphorsulfonic 169
 – carboxylic 354, 355
 – chlorobenzoic 286
 – coumarin-3-carboxylic 66
 – diiodobenzoic 183
 – dodecylbenzenesulfonic 45–48, 51
 – formic 116
 – glyoxylic 246
 – green catalysis 31–54
 – keto, *see* keto acids
 – magic 355
 – phenylcinnamic 283
 – phosphonic 302
 – Shikimic 373
 – styrenesulfonic 279, 281, 282
 – sulfonic 53
 – super- 355
 – ulosonic 322
 acridizinium bromide 242
 acrylates
 – alkyl 239
 – 2-(bromomethyl)- 301
 – fluororous-tagged 154
 – hydroxymethacrylate 380
 acrylic acid 301
 activated complex, cyclic 229
 activated olefins 305, 306
 activation
 – dual 211–213
 – energy of 236, 237
 – Gibbs energy 245
 activity
 – biological 48
 – isomerization 389, 392
 acyclonucleosides 275
 acylation, cyclodextrins 4, 5
 additions
 – aqueous cyclo- 322
 – bis-aza-Michael 283, 284
 – conjugate 219
 – cyclo-, *see* cycloadditions
 – 1,3-dipolar cycloaddition 210, 230, 249–251
 – direct 158
 – *endo* 18
 – heteronucleophiles 211–213
 – nucleophilic 161
 – photocyclo- 248–267
 – α,β -unsaturated derivatives 171, 172
 adducts, Diels–Alder 320
 aerobic oxidation 76
 – direct 221
 – palladium-catalyzed 86–89
 aggregates, surfactant 261–266
Agrobacterium tumefaciens 319

- AIDS, HIV-1 integrase inhibitor 49
- alcohols
- allyl 401, 402
 - ferrocenyl 224
 - hemiterpene 352
 - oxidation 85–94
 - primary 86
 - propargyl 183
 - secondary 87
- aldehydes
- aromatic 286
 - branched/linear 396
 - ‘on water’ oxidation 222
 - oxidations in water 94–96
 - sugar 305, 306
- aldol reactions
- condensation 16, 17
 - cross-aldol condensations 64
 - direct 213–215
 - Mukaiyama 60, 308, 309
 - nitro- 61
- aldolase, deoxyribose-5-phosphate 366–369
- aldoses 299, 300
- alkaline ion-exchange silicates 58
- alkenes
- conjugated 170–172
 - coupling reactions 163–172
 - electron-deficient 63
 - isomerization 165, 166
 - longer chain 399, 400
 - microwave-assisted Heck coupling 275
 - room temperature solubility 399
 - unconjugated 163–170
- alkyl acrylates 239
- alkyl groups, direct addition 158
- alkyl isocyanates 316
- alkylated polystyrene-supported sulfonic acids 53
- alkylations 25, 157, 158
- double *N*- 277, 278
 - Friedel–Crafts 344
 - phenol 344
- alkynes
- coupling reactions 163–172
 - 1,3-dipolar cycloaddition 251
 - oxidative dimerization 181–186
 - terminal 181, 182, 185
 - unconjugated 163–170
- alkynylation 161, 162
- allenylation 156, 157
- allyl alcohol 401, 402
- allyl scavenger 187
- allyl vinyl ether 231
- allylation 152–156
- indium-mediated 298
 - zinc-mediated 153
- allylic substitutions 186
- amidation 355, 356
- amine ligands 82, 83, 128
- amines
- alkylation 277, 278
 - anchored 58
 - poly- 13
 - silica-grafted 68
- amino acids 10
- racemization 12
- 2-aminobenzothiazole 212
- 6-aminopenicillanic acid 371, 372
- aminopropanals 369
- ammonia, aqueous 310
- ammonium acetate 356
- ammonium substituents, quaternary 175
- amphiphiles 264, 265, 296
- catalysts 113
- anchored amines 58
- anion-modified hydrocalcites 70
- anions, chorismate 252
- anti-inflammatory agent 377
- anti-malaria drugs 282
- antibodies 258
- antihydrophobic material 22
- antiviral/antitumor compound 157
- applications, pharmaceutical 363–383
- approximate transition state (TS) theory 226
- aprotic solvents 141, 236
- aqueous ammonia 310
- aqueous binary mixtures 252, 253
- aqueous cycloaddition 322
- aqueous–ionic liquid biphasic medium 60
- aqueous Krohnke reaction 283
- aqueous media
- alcohol oxidations 85–94
 - Lewis acids 31, 32
 - microwave-assisted organic transformations 274–284
 - olefins 78–85
 - pericyclic reactions 234–267
 - Suzuki/Stille coupling 59
- aqueous–organic biphasic
- catalysis 393, 394
 - hydroformylation 394–400
- aqueous pericyclic reactions, microwave-assisted 266, 267
- aqueous phase, reusable basic 64
- aqueous solvents, mixed 378

- aqueous sugar solutions 319–324
 aqueous suspensions 207
 aqueous Suzuki reaction 377, 378
 arenes
 – diazonium tetrafluoroborates 177
 – hydrogenation 114
 aromatic aldehydes 286
 aromatic chlorination 3, 4
 aromatic iodides 183
 aromatic rings, hydrogenation 114, 115
 aromatic substitution, electrophilic 306–308
 aromatics, electron-rich 306
 artificial enzymes 13, 15, 16
 artificial metalloenzymes 134
 artificial odorant 43
 aryl chlorides, cross-coupling 179
 aryl halides, microwave-assisted Heck coupling 275
 aryl iodides 173–180, 217
 arylation 158–161
N-arylation, intramolecular 284
O-arylation, intermolecular 216
 aryldiazonium salts 181
 arylimines 162
 arylodinium salts 181
 arylmercuric chlorides 152
 arylsiloxanes, cross-coupling 190
 5-aryltriazole acyclonucleosides 275
Aspergillus melleus 119
 asymmetric catalysis 151
 asymmetric hydrogenation 118–122
 asymmetric Mannich-type reaction, catalytic 61
 asymmetric reactions, chiral 36–44
 asymmetric synthesis, aza sugars 312
 asymmetric transfer hydrogenation 126–135
 – biomimetic catalysts 133–135
 atom economy 398
 atorvastatin 367–369
 axial position 304
 aza-Diels–Alder reactions 323
 aza-Michael addition, bis- 283, 284
 aza sugars 311, 312
 azide, phenyl 249
 2-azidoethanal 368
 azodicarboxylate, dimethyl 208, 209
 – dimethyl 254
- b**
 β -C-glucosidic ketone 295
 β -hydroxy sulfides 282
 Baeyer–Villiger oxidation 94–96
 Barbier-type reactions 297–305
 barbiturates, C-glycosyl 292
 bases
 – acid–base equilibrium 139, 140
 – base-catalyzed epimerization 365
 – green 57–73
 – Lewis- 60
 – non-ionic 62
 basic aqueous phase, reusable 64
 basic ionic liquid 65
 Baylis–Hillman reactions 62, 305, 306
 – environmentally friendly process 379, 380
 beads, glass 188
 Beckmann rearrangement 338, 350
 benchmark substrate, acetophenone 129, 130
 benzaldehyde 215
 benzene 333, 345
 benzil 350
 benzofurans 182
 benzoic acid 347, 353
 benzoin 23, 351
 benzonitrile oxide 250
 1,4-benzoquinone 218
 benzoxazines 280
 bidentate dienophiles 256, 264
 bidentate phosphane ligand 168
 bimetallic nanoclusters 90
 bimolecular Diels–Alder reaction 237, 243
 binary mixtures, aqueous 252, 253
 binding of species 2, 3
 bioactive heterocycles 280
 biocatalysis 255–259
 bioconjugation reactions 184
 bioconversions 318, 319
 biological activity 48
 biological effluent treatment plant 363
 biomimetic catalysis 133–135
 bioreduction 370, 371
 biotinylated metal catalyst 134
 biphasic catalysis 385, 393, 394
 biphasic hydroformylation 394–400
 biphasic reactions 126–128
 biphasic systems 60, 394
 bipyridine ligand, 4,4'-dimethyl-2,2'- 259
 bis-aldol reaction, tandem 281
 bis-aza-Michael addition 283, 284
 bisimidazolecyclodextrin 17
 bisphenol A decomposition 342
 bleach, household 91–94
 bleaching booster 310
 bond formation

- carbon-carbon, *see* carbon-carbon-forming reactions
 - carbon-nitrogen 309-311
 - hydrogen 213
 - bound ester 5, 6
 - branched aldehydes 396
 - bromides 173-180
 - acridizinium 242
 - cetyltrimethylammonium 37, 130, 133, 263, 264
 - bromination 223, 224
 - oxidative 224
 - bromoenopyranosides 302-304
 - 2-(bromomethyl)acrylates 301
 - 4-bromotoluene 378
 - Suzuki reaction 378
 - Brønsted acids 75
 - catalysis 44-53
 - Brønsted bases 75
 - BSA-catalyzed Diels-Alder reaction 258
 - bulk chemicals, green solvents 385-408
 - butadiene, telomerization 404
 - butadienyl ethers 317
 - 1,4-butanediol 348
- c**
- C₁ interconversion pathways 337
 - Cadiot-Chodkiewicz coupling reaction 166
 - cages, molecular 255
 - camphorsulfonic acid 169
 - camphorsultam derivative 157
 - carbamation 313-317
 - carbenes 16, 165
 - carbocyclic acids 354, 355
 - carbohydrates
 - amphiphiles 296
 - chiral dienes 320, 321
 - functionalization 291-330
 - carbon-carbon bond cleavage 355
 - carbon-carbon-forming reactions 34, 47
 - cross-coupling 375-378
 - functionalization of carbohydrates 292-309
 - HTW 344
 - microwave-assisted 274-277
 - pericyclic 229
 - stereoselective 53
 - carbon dioxide
 - CO₂-enriched HTW 340, 341
 - hydrogenation 116, 117, 141
 - supercritical 1
 - carbon nanotubes, single-walled 225
 - carbon-nitrogen-forming reactions 309-311
 - carbonates 66, 314
 - carbonyl compounds
 - achiral transfer hydrogenation 124-126
 - asymmetric hydrogenation 121, 122
 - coupling reactions 151-163
 - hydrogenation 113, 114
 - unsaturated 213-215
 - carbonyl reductions 18, 19
 - carboxylates, 1,3-dipolar cycloaddition 252
 - carboxylic acids 66, 354, 355
 - carboxypeptidase 6
 - catalysis
 - aqueous-organic biphasic 393, 394
 - asymmetric 151
 - asymmetric Mannich-type reaction 61
 - base-catalyzed epimerization 365
 - Brønsted acid 44-53
 - Cu(II) 257
 - green acid catalysis in water 31-54
 - heterogeneous 385
 - homogeneous 191
 - industrial homogeneous 387
 - intra-complex transfer 4
 - liquid-liquid biphasic 385
 - 'on water' 227
 - organometallic 133
 - oxidations 76-78
 - pericyclic reactions 255-259
 - phase-transfer 80
 - (pre)micellar 231
 - turnover 14
 - yield 32-53
 - catalysts
 - ~ amphiphilic 113
 - biomimetic 133-135
 - biotinylated metal 134
 - BSA 258
 - chiral organic 214
 - cobalt-based 388, 389
 - cyclodextrins 21, 259-261
 - heterogeneous 122
 - hydrophilic 174, 175
 - indium 304
 - iron 84
 - lanthanides 323
 - LASCs 34
 - Lewis acids 153-155
 - Lewis bases 60
 - loading 42
 - losses 393
 - manganese 80
 - metal complex 106
 - modification by ligands 391, 392
 - montmorillonite 306

- nano-sized magnesium oxide 281
- nickel 180
- palladium 86–89, 173–180, 317
- PEG-immobilized 136
- phase-transfer 133
- phosphine-modified rhodium 398
- polymer-supported Brønsted acid 51–53
- PSSA 279, 281, 282
- pyrophoric 376
- quasi-homogeneous 90
- Raney nickel 364
- recovery 401, 402
- recyclable 93
- rhodium 115, 116
- rhodium-based 389–391
- ruthenium 83, 117, 180
- scandium 294
- separation 106, 135–137, 191
- 'sole solvent' 32–36
- surfactant aggregates 261–266
- surfactant-type Brønsted acid 51–53
- thermoresponsive 91
- transition metals 124, 215, 216
- Yamamoto–Yanagisawa 155
- cation-exchanged zeolites 70
- cationic amphiphiles 265
- cells, electrochemical 339
- cetyltrimethylammonium bromide (CTAB) 37, 130, 133, 263, 264
- chain-elongated sugars 299
- chain elongation 299–301
- chalcones 63
- chelating transition state 298
- chemical kinetics, solution-phase 336
- chemical potentials 237, 238
- chemoselective deprotection 187
- chiral amine ligands 83
- 'chiral-at-metal' species 135
- chiral cationic amphiphile 265
- chiral dienes, carbohydrate-based 320, 321
- chiral Lewis acid-catalyzed asymmetric reactions 36–44
- chiral organic catalysts 214
- chiral sulfur ylides 63
- chiral water-soluble ligands 108
- chlorides
 - aryl 179
 - arylmercuric 152
 - fatty acid 315
- chlorination, aromatic 3, 4
- o-chlorobenzoic acid 286
- chloroformates 314, 315
- chorismate anion 252
- cis-hydroxylation 81
- Claisen rearrangement 207, 230, 231, 251, 252
 - 1,3-diols 323
 - monomolecular 261
- Claisen–Schmidt condensation 346
- classical resolution process 366
- cleavage, carbon–carbon bond 355
- cobalt-based hydroformylation catalysts 388, 389
- cocatalysts 96
- coenzymes 9–15
- cohesive energy density 233
- colloidal dispersions 188
- colloids, protective-colloid agents 164
- complexes
 - coordination 82
 - cyclic activated 229
 - half-sandwich 110
 - half-sandwich metal 123
 - hydrophobic 19
 - hydroxo 397
 - intra-complex transfer 4
 - metal complex catalyst 106
 - model dihydrogen 139
 - monoaqua 138
 - organometallic 129, 130
 - tethered 132
 - tetranuclear 110
- computational modeling 337–339
- condensations
 - aldol 16, 17
 - Claisen–Schmidt 346
 - cross-aldol 64
 - HTW 346–348
 - Knoevenagel 292–297
 - nano-sized magnesium oxide-catalyzed 281
- conductivity, thermal 332
- conformational behavior, sucrose 313
- conjugate addition, Friedel–Crafts-type 219
- conjugated alkenes, coupling reactions 170–172
- control
 - diastereoselectivity 303, 304
 - end-of-pipeline 232
 - geometric 9
- cooling, internal 400
- coordination complexes 82
- coordination to metals, water 138, 139
- copolymerization, diiodobenzoic acid 183

- copper, Cu(II) catalysis 257
- copper-mediated coupling 161
- cosolvents 316
- coumarin 249
- coumarin-3-carboxylic acids 66
- coupling
 - alkenes and alkynes 163-172
 - aqueous media 59
 - carbonyl compounds 151-163
 - copper-mediated 161
 - cross- 179-181, 190
 - cross-dehydrogenative 219
 - dehydrative 218
 - dehydrogenative 216-221
 - direct 218
 - Glaser, Eglinton and Cadiot-Chodkiewicz 166
 - Hartwig-Buchwald 189
 - Heck 345, 346
 - in water 151-206
 - 'on water' 215-221
 - organic halides 172-191
 - oxidative 219
 - pinacol 162, 163, 286
 - Sonogashira 182-184
 - Stille 59, 180, 181
 - Suzuki 59, 60, 66, 176
 - Suzuki-Miyaura 215
- Crestor 366, 367
- critical values 331, 334
- cross-aldol condensations 64
- cross-coupling
 - aryl chlorides 179
 - arylsiloxanes 190
 - carbon-carbon 274
 - carbon-carbon-forming reactions 375-378
 - Hiyama 276
 - Sonogashira 276
 - transition metal-catalyzed 215, 216
- cross-dehydrogenative coupling 219
- CTAB, *see* cetyltrimethylammonium bromide
- Cu(II) catalysis, copper 257
- cyclic activated complex 229
- cyclic ketones 95
- cyclic peptides 287
- cyclic transition state 303, 304
- cyclization 167-170
 - Nazarov 346-348
 - Prins-type 369
 - RNA 7
- cycloadditions 207, 320, 321
 - aqueous 322
 - 1,3-dipolar 210, 230, 249-251
 - photo- 248-267
- cyclodextrins 6
 - acylation 4, 5
 - bisimidazole- 17
 - catalysts 21
 - imidazole rings 8
 - modified 164
 - pericyclic reactions 259-261
 - pyridoxal unit 11
 - thiazolium salt 16
- cyclohexanol, dehydration 340
- cyclohexanone 215, 288
- cyclohexanone oxime 338
- cyclopentadiene 236, 237, 242
- cyclopropanation, styrene 165
- cycloreversion 247
- cyclotrimerization 167-170

- d**
 - DBSA, *see* dodecylbenzenesulfonic acid
 - decanting 334
 - decarboxylation 283
 - oxidative 353
 - decarboxylative transaminations 14, 15
 - decomposition, bisphenol A 342
 - dehalogenase, halohydrin 369
 - dehydration
 - 1,4-butanediol 348
 - cyclohexanol 340
 - D-glucose 352
 - HTW 351-353
 - dehydrative coupling 218
 - dehydrogenative coupling 216-221
 - density, water 332
 - 2-deoxyaldoses 299
 - deoxybenzoin derivatives 216
 - deoxyribose-5-phosphate aldolase (DERA) 366-369
 - depression 376, 377
 - deprotection, chemoselective 187
 - deprotonation 139
 - derivatives
 - carbonyl 151-163
 - furan 293
 - organic halides 172-191
 - phenol 219
 - polyfunctional unsaturated 167-170
 - α,β -unsaturated 171, 172
 - detergents, bleaching booster 310
 - deuterium, H-D exchange 140, 141, 355
 - DFT calculations 139-141, 226
 - diamine-enabled protocol 130
 - diarylmethanols 160

- diastereoisomers 300
 - diastereoselectivity 156, 162
 - functionalization of carbohydrates 303, 304
 - hydroxyl functionalization 169
 - 'on water' reactions 214
 - diazooacetate, ethyl 69
 - diazocarbonyl 251
 - diazonium salts 173-180
 - diazonium tetrafluoroborates,
 - arene 177
 - dibenzyl ether hydrolysis 341
 - dielectric constant, water 332
 - water 336
 - Diels-Alder adducts 320
 - Diels-Alder reactions 23, 209, 210
 - aza- 323
 - bimolecular 237, 243
 - BSA-catalyzed 258
 - enantioselective 258
 - forward 244-248
 - hydrophobic acceleration 17, 18
 - intramolecular 242, 243
 - inverse electron-demand 234-242
 - retro- 243, 244
 - retro-hetero- 244-248
 - dienes 403
 - carbohydrate-based chiral 320, 321
 - hydrophobicity 240
 - polarity 263
 - telomerization 170, 171
 - dienophiles
 - bidentate 256, 264
 - dienophile affect 239
 - glyoxylic acid 246
 - hydrophobicity 240
 - diffusional 377, 378
 - dihydrogen complex, model 139
 - dihydropyrimidinones 279
 - dihydroxylation 78-85
 - diiodobenzoic acid, copolymerization 183
 - diketones 297
 - dimedone 294
 - dimerization
 - hemiterpene alcohols 352
 - oxidative 181-186
 - photo- 248
 - dimethyl azodicarboxylate 208, 209, 254
 - 4,4'-dimethyl-2,2''-bipyridine ligand 259
 - dimethyl sulfoxide (DMSO) 24
 - 1,3-diols 323
 - dioxanes 280
 - dipeptides 3
 - diphosphine ligands 122
 - 1,3-dipolar cycloaddition 210, 230, 249-251
 - dipolarophiles 250
 - direct addition, alkyl groups 158
 - direct aerobic oxidation 221
 - direct aldol reaction 213-215
 - direct coupling, indole compounds 218
 - C-disaccharides 305
 - discrimination, facial 322
 - diseases
 - AIDS 49
 - depression 376, 377
 - malaria 282
 - dispersions, colloidal 188
 - DMSO, *see* dimethyl sulfoxide
 - dodecyl sulfate, sodium 120, 130, 165, 263, 264
 - dodecylbenzenesulfonic acid (DBSA) 45-48, 51
 - double N-alkylation 277, 278
 - double-tailed amphiphile 264
 - droplet size 255
 - drugs
 - anti-depression 377, 378
 - anti-inflammatory agents 377
 - antiviral/antitumor 157
 - Prexige 379
 - Tamiflu 372-374
 - Viagra 374, 375
 - *see also* pharmaceutical compounds
 - dual activation 211-213
- e**
- electrochemical cells 339
 - electrochemical methods 155
 - electrodes, graphite 155
 - electron-deficient alkenes, epoxidation 63
 - electron-demand Diels-Alder reactions 234-242
 - electron-donating substituents 88
 - electron-poor dipolarophiles 250
 - electron-rich aromatics 306
 - electron-withdrawing groups 171
 - electrophiles, functionalized 177
 - electrophilic aromatic substitution 306-308
 - elimination 353
 - 'emulsion-like' system 121
 - emulsions 164
 - micro- 266
 - enantiomers 10, 11
 - enantioselectivity
 - Diels-Alder reactions 258
 - direct aldol reactions 213-215

- hydrogenation 119, 120, 127
 - sulfoxidation 97
 - end-of-pipeline control 232
 - endo* addition 18
 - endo/exo* isomers 235
 - ene reactions 207
 - energy
 - non-conventional sources 273–290
 - energy curve 22
 - energy density, cohesive 233
 - energy of activation, Gibbs 236, 237
 - enforced hydrophobic interaction 238, 241, 250
 - engineering, HTW process engineering 334, 335
 - enol ether, silyl 32
 - silyl 309
 - enolate, silicon 41
 - enolization 16, 17
 - enone 346
 - environmentally friendly Baylis–Hillman process 379, 380
 - enzymatic hydrolysis 119
 - enzymatic processes 363–374
 - enzymes
 - aldolase 366–369
 - artificial 13, 15, 16
 - artificial metallo- 134
 - asymmetric transfer hydrogenation 133
 - carboxypeptidase 6
 - DERA 366–369
 - glucose dehydrogenase 318
 - halohydrin dehalogenase 369
 - HIV-1 integrase 49
 - metallo- 5, 6
 - neuramidase 372
 - ribonuclease 7–9
 - tyrosine kinase 178
 - epimerization 365
 - epoxidations
 - electron-deficient alkenes 63
 - iron-catalyzed 84
 - manganese-catalyzed 80
 - olefins 78–85
 - ruthenium-catalyzed 83
 - solvent- and halide-free 79
 - epoxide hydrolysis 317
 - epoxide ring-opening reaction 39, 40
 - epoxides
 - fatty 317
 - *meso*- 39
 - equatorial position 303
 - equilibration, acid-facilitated 121
 - equilibrium, acid–base 139, 140
 - esterification 313–317
 - esters
 - bound 5, 6
 - hydrazono 156
 - sucrose 314
 - ethene 399
 - etherification 313–317
 - ethers
 - allyl vinyl 231
 - butadienyl 317
 - dibenzyl 341
 - silyl enol 32, 309
 - ethyl diazoacetate 69
 - extractor column 402
- f**
- facial discrimination 322
 - fatty acid chlorides 315
 - fatty diketones, symmetrical 297
 - fatty epoxides 317
 - ferrocenyl alcohols 224
 - flash heating 273
 - fluorous-tagged acrylates 154
 - formaldehyde (HCHO) 41–44
 - formic acid 116
 - formyl C-glucoside 308
 - forward Diels–Alder reactions 244–248
 - free radicals
 - intermediates 223
 - stable 87, 91–94
 - Friedel–Crafts-type reactions 34, 51
 - alkylation 344
 - conjugate addition 219
 - D-fructose 296
 - functionalization
 - carbohydrates 291–330
 - diastereoselective 169
 - electrophiles 177
 - hydroxyl groups 169, 312–317
 - olefins 109
 - SWNTs 225
 - furan derivatives 260
 - trihydroxyalkyl-substituted 293
- g**
- γ -adduct 155
 - gasless approach to hydrogenation 116
 - geometric control 9
 - geometry
 - rigid 5
 - transition states 21–25
 - Gibbs energy of activation 236, 237, 245

- Gibbs energy of transfer 241
 Glaser, Eglinton and Cadiot–Chodkiewicz coupling 166
 glass beads 188
 D-glucosamine 294
 D-glucose, dehydration in HTW 352
 glucose dehydrogenase 318
 C-glucosidation 307
 C-glucoside, formyl 308
 glycamines 309–311
 – surfactants 311
 glyceraldehyde, derivatives 321
 glycine 12
 glyco-organic substrates 319–324
 C-glycolipids 297
 C-glycosyl barbiturates 292
 glycosylamines 309–311
 N-glycosylation 311
 – yields 312
 glyoxylic acid, dienophiles 246
 (+)-goniofurfurone 157
 grafting 68
 graphite electrodes 155
 green acid catalysis 31–54
 green bases 57–73
 Green Chemistry
 – Handbook of 232, 386
 – holistic concept 232
 – non-conventional energy sources 273–290
 – ‘on water’ conditions 207–228
 – 12 Principles of 152, 232, 399
 – water as solvent 1–29
 – water under extreme conditions 331–361
 green oxidation 75–103
 green reduction 105–149
 – role of water 137
 green solvents 232–234
 – bulk chemicals 385–408
 ‘greenest’ solvent 142
 Grignard-type reactions 151–162
 groups
 – alkyl 158
 – electron-withdrawing 171
 – oxime 5
 – polar 107
 – pyridoxal unit 11
 guanidynylated phosphanes 184
- h**
 H-D exchange 140, 141
 – HTW 355
 half-sandwich complexes 110
 – metal 123
 halide-free epoxidation 79
 halides
 – aryl 275
 – organic 172–191
 – pseudo- 178
 – see also bromides, chlorides, iodides
 halobenzene 345
 halohydrin dehalogenase 369
 Handbook of Green Chemistry 232, 386
 Hartwig–Buchwald coupling 189
 Hattori’s classification 58
 HCHO 41–44
 heat exchange 335
 heating, flash 273
 Heck coupling
 – HTW 345, 346
 – microwave-assisted 274
 hemiterpene alcohols 352
 heptoses 300
 hetero-Diels–Alder reactions, retro- 244–248
 heteroaryl ketones 130, 131
 heteroatom-based nucleophiles 211
 heterocoupling 172, 173
 heterocycles 277–284
 – bioactive 280
 – heterocyclic hydrazones 282
 – heterocycloreversion 247
 – nitrogen-containing 277–280
 – oxygen-containing 280, 281
 – sonochemical reactions 285
 heterogeneous catalysis 122
 – bulk chemicals 385
 heteronucleophiles 213–215
 hexadentate imidazolium salts 159
 high-temperature water (HTW) 331–355
 – benzene solubility 333
 – CO₂-enriched 340, 341
 – organic synthesis 335
 – properties 332–334
 higher olefins 403
 highly hindered diarylmethanols 160
 highly polar substrates 122
 Hildebrand solubility parameter 253
 hindered diarylmethanols 160
 HIV-1 integrase inhibitor 49
 Hiyama–Heck reactions, one-pot 190
 Hiyama reaction 189–191, 276
 homocoupling 172, 173
 homogeneous catalysis 191
 – industrial processes 387

- household bleach, hypochlorite 91–94
 - HTW, *see* high-temperature water
 - hydration 233, 351–353
 - hydrazines, alkylation 277, 278
 - hydrazones, heterocyclic 282
 - hydrazono esters 156
 - hydride transfer 117
 - hydroarylation 166, 167
 - hydrocarbons, hydrophobic effect 2
 - hydroformylation 163, 164, 386–393
 - aqueous–organic biphasic 394–400
 - cobalt-based catalysts 388, 389
 - industrial processes 388–392
 - longer chain alkenes 399, 400
 - propene 395, 396
 - rhodium-based catalysts 389–391
 - hydrogen
 - bond formation 213
 - bonding interactions 141
 - H–D exchange 140, 141, 355
 - hydrogen-bonding solvents 244
 - hydrogen peroxide (H₂O₂) 77–86, 90–97
 - photochemical reactions 287
 - hydrogenations 105
 - achiral 109
 - arenes 114
 - aromatic rings 114, 115
 - asymmetric 118–122
 - carbon dioxide 116, 117
 - carbonyl compounds 113, 114
 - enantioselectivity 119, 120, 127
 - gasless approach 116
 - HTW synthesis 343
 - hydroformylation 387
 - in water 108–122
 - olefins 109–113
 - selective 110
 - transfer, *see* transfer hydrogenation
 - hydrolysis
 - dibenzyl ether 341
 - enzymatic 119
 - epoxide 317
 - HTW 348–350
 - nitrile 336
 - hydrophilic catalysts 174, 175
 - hydrophilic starches 77, 78
 - hydrophilic substrates 40, 41
 - hydrophobic acceleration, Diels–Alder reactions 17, 18
 - hydrophobic association 243
 - hydrophobic complexes 19
 - hydrophobic dienes and dienophiles 240
 - hydrophobic effect 2, 3, 5, 6
 - carbonyl reductions 18, 19
 - geometries of transition states 21–25
 - hydrogenation 141
 - ‘on water’ conditions 207, 212
 - hydrophobic interaction, enforced 238, 241, 250
 - hydrophobic ketones 17
 - hydrotalcites 67
 - anion-modified 70
 - ‘hydrothermal’ fluids 267
 - hydroxo complexes 397
 - hydroxycarbonylation 164
 - hydroxyl-bridged palladium(II) dimer 88
 - hydroxyl functionalization 312–317
 - diastereoselective 169
 - hydroxylation 20
 - *cis*- 81
 - hydroxymethylacrylate 380, 381
 - hydroxymethylation 40–44
 - hypervalent iodine compounds 91
 - hypochlorite (household bleach) 91–94
- i*
- imidazole rings 8
 - imidazolium salts, hexadentate 159
 - imines
 - aryl- 162
 - asymmetric transfer hydrogenation 132, 133
 - hydrogenation 115, 116
 - reduction 132
 - indium 304
 - indium-mediated allylation 298
 - indoles 182
 - direct coupling 218
 - industrial processes
 - bulk chemicals 385–408
 - homogeneous catalytic 387
 - hydroformylation 388–392
 - paint industry 2
 - inhibitors
 - HIV-1 integrase 49
 - neuramidase 372
 - tyrosine kinase 178
 - insolubility 106
 - interface, oil–water 226
 - intermolecular O-arylation 216
 - internal cooling 400
 - intracomplex transfer 4
 - intramolecular Diels–Alder reactions 242, 243
 - intramolecular N-arylation 284

- inverse electron-demand Diels–Alder reactions 234–242
- iodides
- aromatic 183
 - aryl 173–180, 217
 - vinyl 173–180
- iodine compounds, hypervalent 91
- ion-exchange silicates, alkaline 58
- ion product, water 332
- ion-supported TEMPO 93
- ionic liquids 34–36
- basic 65
 - hydrogenation 111
 - room temperature 239
- ionization potential, metals 298
- iron-catalyzed epoxidations 84
- iso-to-normal* ratio 390
- isocyanates, alkyl 316
- isoelectric point 374, 375
- isomerization 165, 387
- isomerization activity 389, 392
- isomers, *endo/exo* 235
- j**
- Juliá–Colonna method 63
- k**
- kanosamine 373
- KDN 300–302, 321
- keto acids 10
- transamination 15
- ketol intermediates 346
- ketones
- asymmetric transfer hydrogenation 126–132
 - cyclic 95
 - β -C-glucosidic 295
 - heteroaryl 130, 131
 - hydrophobic 17
 - oxidations in water 94–96
 - tandem bis-aldol reaction 281
 - α,β -unsaturated 347
- 3-ketosucrose 319
- kinetics, solution-phase 336
- Kirkwood plot 337
- Knoevenagel reactions 61, 64, 65, 292–297
- Krohnke reaction, aqueous 283
- Kuhlmann process 388
- Kuraray process 402
- l**
- lanthanide-catalyzed aza-Diels–Alder reactions 323
- lanthanide triflates 258
- leaching, palladium 176
- Lewis acid–surfactant combined catalyst (LASCs) 33, 34
- Lewis acids 75, 153–155
- chiral catalysts 36–44
 - in water 31–36
 - pericyclic reactions 256, 257
- Lewis bases 75
- catalysts 60
- life-cycle assessment 336
- ligands
- achiral 107
 - catalyst modification 391, 392
 - chelating 126
 - chiral 108
 - chiral amine 83
 - 4,4'-dimethyl-2,2''-bipyridine 259
 - diphosphine 122
 - phosphane 168
 - phosphonium salt 404, 405
 - (S)-proline amide 128
 - pyridylamine 82
 - soft 75
 - tetraamido macrocyclic 76–78
 - trisulfonated triphenylphosphine 396
 - water-soluble 76, 77, 107
- light, UV 287
- Lilly process 371
- linear aldehydes 396
- linear multi-parameter model, AKT 253
- Lipitor 367–369
- liquid–liquid biphasic catalysis 385
- liquid–liquid processes 59–65
- liquids
- biphasic media 60
 - ionic, *see* ionic liquids
 - non-polar 210
 - solid–liquid processes 65–70
- loading, catalyst 42
- long-chain alkenes, hydroformylation 399, 400
- long-chain olefins 163
- low-pressure oxo (LPO) processes 390
- lumiracoxib process 379
- LY300164 369–371
- Lyrica process 364–366
- m**
- macrocyclic ligand, tetraamido 76–78
- magic acid 355
- magnesium oxide, nano-sized 281
- maleimides 267
- manganese-catalyzed epoxidation 80

- Mannich-type reactions 36, 37, 47, 48
 – asymmetric 61
 medium effects 251
meso-epoxides 39
 metal catalysts, biotinylated 134
 metal complex catalyst 106
 metal oxide bases 58
 metal salts 32
 metallo-ene reactions 168
 metalloenzymes 5, 6, 134
 metallophthalocyanines 76–78
 metalloporphyrins 76–78
 metals
 – Barbier-type reactions 298
 – half-sandwich complexes 123
 – ionization potential 298
 – transition. *see* transition metals
 metathesis 165
 methacrolein 321
 methyl carboxylate 252
 methylation, hydroxy- 40–44
 2-methylindole 218
 micellar catalysis 231
 micellar effect 265
 micellar systems 91
 – nano- 112
 Michael addition, bis-aza- 283, 284
 Michael reactions 36–38
 – non-ionic bases 62
 – silica-grafted amines 68
 microemulsions 164, 266
 microorganisms, asymmetric transfer
 hydrogenation 133
 micropores 85
 microwave, flash heating 273
 microwave-assisted reactions 274–284
 – pericyclic 266, 267
 microwave conditions 176
 mimics
 – biomimetic catalysts 133–135
 – enzymes 7–17
 – metalloenzymes 5, 6
 – ribonuclease 7–9
 – thiamine pyrophosphate 15, 16
 mixed aqueous solvents, pharmaceutical
 processes 378
 mixtures, aqueous binary 252, 253
 Mizoroki–Heck reaction 166, 167
 model
 – AKT 253
 – pseudo-phase 261, 262
 model dihydrogen complex 139
 model reaction 47, 48
 modeling
 – DFT calculations 139–141, 226
 – molecular and computational 337–339
 modified cyclodextrins 164
 mole fraction of water 238
 molecular area 34
 molecular cages 255
 molecular modeling 337–339
 molecules, self-assembly 179
 monoaqua complexes 138
 monometallic nanoclusters 90
 monomolecular Claisen rearrangement
 261
 monomolecular sigmatropic reaction 230
 Montanari protocol 92
 montmorillonite 306
 Mukaiyama aldol reaction 60, 308, 309
 multi-parameter model, AKT 253
 multiple stirrers 400
- n**
- N*-methylpyrrolidone (NMP) 402, 403
 Nafion resin 84
 nano-sized magnesium oxide 281
 nanoclusters 90
 nanomicelles 112
 nanotubes, single-walled carbon 225
 sodium, *see* sodium
 Nazarov cyclization 346–348
 neocuproin 89, 90
 neuramidase inhibitor 372
 nickel-catalyzed reactions 180
 nitrile hydrolysis 336
 nitriles, hydrogenation 115, 116
 nitro compounds, hydrogenation 115,
 116
 nitroaldol reactions 61
 nitrogen, carbon–nitrogen-forming
 reactions 309–311
 nitrogen-containing heterocycles 277–280
 ‘no catalyst added’ procedure 177
 non-aqueous systems, industrial
 hydroformylation processes 388–392
 non-conventional energy sources, green
 chemistry 273–290
 non-ionic bases 62
 non-polar liquids 210
 norbornene 249
 nucleophiles 403
 – heteroatom-based 211
 nucleophilic addition, Grignard-type 161
 nucleophilic oxime groups 5
 nucleophilic ring opening 207
 nucleophilic substitution, ‘on water’ 224,
 225

- o**
- 2,7-octadien-1-ol 402
 - octoses 301
 - odorant, artificial 43
 - oil-water interface 226
 - olefins 78–85
 - activated 305, 306
 - asymmetric hydrogenation 118–121
 - functionalized 109
 - higher 403
 - hydrogenation 109–113
 - long-chain 163
 - substituted 86
 - terminal 86
 - oligomerization 393, 403
 - 'on water' catalysis 227
 - 'on water' conditions 207–228
 - rate enhancement 226
 - solvents 209
 - 'on water' pericyclic reactions 254, 255
 - one-electron oxidation 94
 - one-pot Hiyama–Heck reactions 190
 - Oppolzer camphorsultam derivative 157
 - organic biphasic catalysis, aqueous–
 - 393, 394
 - organic catalysts, chiral 214
 - organic halides, coupling reactions
 - 172–191
 - organic solutes, hydration 233
 - organic solvents 209, 210
 - polar 115
 - organic synthesis in HTW 335
 - organic transformations, microwave-
 - assisted 274–284
 - organosoluble conditions 151
 - organometallic catalysis 133
 - organometallic complexes 129, 130
 - organometallic systems, recyclable 151
 - oseltamivir phosphate 372–374
 - oxidations
 - aerobic 76, 86–89
 - alcohol 85–94
 - aldehydes 94–96, 222
 - Baeyer–Villiger 94–96
 - catalyzed 76–78
 - direct aerobic 221
 - green 75–103
 - hydrophobic effect 19–21
 - hydroxyl functionalization 318, 319
 - ketones 94–96
 - 'on water' 221–223
 - one-electron 94–96
 - partial 354, 355
 - 1-phenyl-1-trimethylsilyloxypropene 222
 - sulf- 96, 97
 - oxidative bromination 224
 - oxidative coupling 219
 - oxidative decarboxylation, benzoic
 - acid 353
 - oxidative dimerization, alkynes 181–186
 - oxides
 - benzonitrile 250
 - carbon dioxide, *see* carbon dioxide
 - metal 58
 - nano-sized magnesium 281
 - oxidoreductases 76, 97
 - oximes
 - cyclohexanone 338
 - nucleophilic groups 5
 - oxo processes, low-pressure 390
 - oxo synthesis, *see* hydroformylation
 - oxygen-containing heterocycles 280, 281
 - ozonolysis 300
- p**
- paint industry 2
 - palladium-catalyzed aerobic oxidation
 - 86–89
 - palladium-catalyzed reactions 173–180
 - palladium-catalyzed telomerization 317
 - palladium leaching 176
 - palladium(II) dimer, hydroxyl-bridged 88
 - PAMAM 14
 - partial oxidation 354, 355
 - Passerini reaction 223
 - PEG-immobilized catalyst 136
 - penicillin G 371, 372
 - pentane-2,4-dione 294–296
 - pericyclic reactions 208–210, 229–271
 - aqueous media 234–267
 - microwave-assisted 266, 267
 - 'on water' 254, 255
 - stereochemistry 261
 - petrochemistry 393, 406
 - pH adjustment 374, 375
 - pH effects 339–343
 - pharmaceutical compounds 173
 - acyclonucleosides 275
 - anti-inflammatory 377
 - anti-malaria drugs 282
 - antiviral/antitumor 157
 - water as green solvent 363–383
 - phase separation, water-induced 401, 402
 - phase-transfer catalysis 133
 - reaction-controlled 80
 - 1,10-phenanthroline ligands 126
 - phenol alkylation 344
 - phenol derivatives 219

- 1-phenyl-1-trimethylsilyloxypropene, oxidation 222
- phenylazide 249
- phenyl-phenyl overlap 24
- phenylalanine 10
- phenylboronic acid 378
- α -phenylcinnamic acid derivatives 283
- 2-phenylthiazole 217
- phenyltrimethyltin 160
- phloroacetophenone 307
- phosphabicyclononane 391, 392
- phosphanes
 - bidentate ligands 168
 - guanidinylated 184
- phosphate
 - oseltamivir 372-374
 - pyridoxamine/pyridoxal 9-15
- phosphenylenes 174
- phosphine-modified rhodium catalyst 398
- phosphines 107
 - water-soluble 114
- phosphonic acid 302
- phosphonium salt 404, 405
- photochemical reactions, non-conventional energy sources 287, 288
- photocycloadditions 248-267
- photodimerization 248
- pinacol coupling 162, 163
 - sonochemical 286
- pinacol rearrangement 350
- PIPO (polymer-immobilized piperidinyloxy) 92, 93
- polar groups 107
- polar organic solvents 115
- polar substrates 122
- polar transition state 278
- polarity, dienes 263
- pollution prevention 232
- polyamines 13
- polyfunctional unsaturated derivatives 167-170
- polymer-immobilized piperidinyloxy 92, 93
- polymer-supported Brønsted acid catalysts 51-53
- polymer-supported carbonates 66
- polymer-supported scandium triflate 34
- polymerization reactions 165
- polymers
 - styrene-based 51
 - unsaturated 112
- polyorganosiloxanes 349
- polystyrene-supported sulfonic acids, alkylated 53
- poly(styrenesulfonic acid) (PSSA) 279, 281, 282
- polyvinylsaccharides 293
- porphyrin ring 20
- potential, chemical 237, 238
- pregabalin process 364-366
- (pre)micellar catalysis 231
- Prexige 379
- primary alcohols 86
- Prins-type cyclization 369
- process engineering, HTW 334, 335
- processes
 - Baylis-Hillman 379, 380
 - classical resolution 366
 - enzymatic 363-374
 - industrial 387-392
 - Kuhlmann 388
 - Kuraray 402
 - Lilly 371
 - liquid-liquid 59-65
 - low-pressure oxo 390
 - lumiracoxib 379
 - pregabalin 364-366
 - Rhône-Poulenc 395-399
 - sampatrilat 374, 375
 - solid-liquid 65-70
 - UCC 403
 - *see also* reactions
- prochiral sulfides 97
- (S)-proline amide ligand 128
- propargyl alcohols 183
- propargylation 156, 157
- propene hydroformylation 395, 396
- protective-colloid agents 164
- protic solvents 235, 236
- protocols
 - diamine-enabled 130
 - Montanari 92
- proton inventory 8
- pseudo-halides 178
- pseudo-phase model 261, 262
- PSSA, *see* poly(styrenesulfonic acid)
- pure water 44-53
- pyridoxal phosphate 9-15
- pyridoxal unit 11
- pyridoxamine phosphate 9-15
- pyridylamine ligands 82
- pyrophoric catalyst 376
- pyrophosphate, thiamine 15, 16

- q**
- quadricyclane 208, 209, 254
 - quasi-homogeneous catalysts 90
 - quaternary ammonium substituents 175
- r**
- racemic pregabalin 364
 - racemization, amino acids 12
 - Raney nickel catalyst 364
 - rate constants, second-order 262
 - rate enhancement, 'on water' conditions 226
 - reactants, water-insoluble 207
 - reaction-controlled phase-transfer catalysis 80
 - reactions
 - acylation 4, 5
 - addition, *see* additions
 - aldol, *see* aldol reactions
 - alkylation 25, 157, 158
 - alkynylation 161, 162
 - allenylation 156, 157
 - allylation 152–156
 - amidation 355, 356
 - aqueous Suzuki 377, 378
 - aromatic chlorination 3, 4
 - arylation 158–161
 - asymmetric 36–44
 - Barbier-type 297–305
 - Baylis–Hillman 62, 305, 306, 379, 380
 - benzoin 23
 - bioconjugation 184
 - bioreduction 370, 371
 - biphasic 126–128
 - bisphenol A decomposition 342
 - bromination 223, 224
 - carbon–carbon-forming, *see* carbon–carbon-forming reactions
 - carbon–nitrogen-forming 309–311
 - chiral 36–44
 - Claisen rearrangement, *see* Claisen rearrangement
 - condensations, *see* condensations
 - coupling, *see* coupling
 - cyclization 7, 167–170, 346–348
 - cycloaddition, *see* cycloadditions
 - cyclopropanation 165
 - cycloreversion 247
 - cyclotrimerization 167–170
 - decarboxylation 283
 - decarboxylative transaminations 14, 15
 - dehydration 340, 348, 351–353
 - deprotonation 139
 - Diels–Alder, *see* Diels–Alder reactions
 - dihydroxylation 78–85
 - dimerization 181–186, 352
 - double *N*-alkylation 277, 278
 - elimination 353
 - ene 207
 - enolizations 16, 17
 - enzymatic hydrolysis 119
 - epimerization 365
 - epoxidation, *see* epoxidations
 - epoxide ring-opening 39, 40
 - Friedel–Crafts-type 34, 51, 219, 344
 - geometries of transition states 21–25
 - C-glucosidation 307
 - grafting 68
 - Grignard-type 151–162
 - heterocoupling 172, 173
 - heterocycloreversion 247
 - Hiyama 189–191
 - Hiyama–Heck 190
 - homocoupling 172, 173
 - hydration 351–353
 - hydroarylation 166, 167
 - hydroformylation 163, 164, 386–393
 - hydrogenation, *see* hydrogenations
 - hydrolysis 119, 317, 336, 341, 348–350
 - hydroxycarbonylation 164
 - hydroxylation 20
 - hydroxymethylation 40–44
 - in aqueous sugar solutions 319–324
 - isomerization 165, 166, 387
 - Knoevenagel 61, 64, 65, 292–297
 - Krohnke 283
 - Kuhlmann process 388
 - Kuraray process 402
 - Lewis acid-catalyzed 36–44
 - liquid–liquid processes 59–65
 - Mannich-type, *see* Mannich-type reactions
 - metallo-ene 168
 - metathesis 165
 - Michael, *see* Michael reactions
 - Mizoroki–Heck 166, 167
 - monomolecular sigmatropic 230
 - *N*-glycosylation 311
 - Nazarov cyclization 346–348
 - nickel-catalyzed 180
 - nitroaldol 61
 - oligomerization 393, 403
 - oxidation, *see* oxidations
 - oxidative decarboxylation 353
 - oxidative dimerization 181–186
 - ozonolysis 300
 - palladium-catalyzed 173–180
 - Passerini 223

- pericyclic, *see* pericyclic reactions
 - photochemical 287, 288
 - photodimerization 248
 - polymerization 165
 - Prins-type cyclization 369
 - propargylation 156, 157
 - reduction, *see* reductions
 - ruthenium-catalyzed 180
 - saponification 57
 - Schotten-Baumann procedure 376
 - solid-liquid processes 65-70
 - sonochemical 285
 - Sonogashira 181-186
 - stereoselective C-C-bond-forming 53
 - substitution, *see* substitutions
 - Suzuki 378
 - Suzuki-Miyaura (S-M) 173-180
 - tandem bis-aldol 281
 - telomerization 170, 171, 317, 404
 - thiolysis 282
 - Tsuji-Trost 186-188
 - Ullmann-Goldberg 286
 - vinylation 158-161
 - *see also* processes
 - reactivity, carbenes 165
 - reactors
 - design 400-402
 - supramolecular 179
 - tank 400
 - tubular 400
 - reagents
 - stoichiometric 75
 - trapping 247
 - rearrangements
 - Beckmann 338, 350
 - Claisen 207, 230, 231, 251, 252, 261, 323
 - HTW 350, 351
 - pinacol 350
 - recovery, catalysts 401, 402
 - recyclable catalysts 93, 106, 135-137, 191
 - recyclable organometallic systems 151
 - recycle, aqueous 335
 - reducing sugars 292
 - reductions
 - bio- 370, 371
 - carbonyl 18, 19
 - green 105-149
 - imines 132
 - regioselectivity 265
 - relative standard chemical potentials 237, 238
 - resin, Nafion 84
 - resolution process, classical 366
 - retro-Diels-Alder Reactions 243, 244
 - retro-hetero-Diels-Alder reactions 244-248
 - reusable basic aqueous phase 64
 - rhodium, phosphine-modified catalysts 398
 - rhodium catalysts 115, 116, 389-391
 - ribonuclease, mimics 7-9
 - D-ribose 294
 - rigid geometry 5
 - rings
 - aromatic 114, 115
 - epoxide 39, 40
 - imidazole 8
 - nucleophilic opening 207
 - porphyrin 20
 - RNA, cyclization 7
 - rod-coil molecules, self-assembly 179
 - room temperature ionic liquids 239
 - room temperature solubility, *n*-alkenes 399
 - rosuvastatin 366, 367
 - Ruhrchemie-Rhône-Poulenc process 395-399
 - ruthenium catalysts 83, 117, 180
- S**
- saccharides
 - C-di- 305
 - polyvinyl- 293
 - *see* sugars
 - salts
 - aryldiazonium 181
 - arylidinium 181
 - diazonium 173-180
 - imidazolium 159
 - metal 32
 - phosphonium 404, 405
 - thiazolium 16
 - sampatrilat process 374, 375
 - sandwich complexes, half- 110
 - saponification 57
 - scandium, silica gel-supported 34-36
 - scandium triflate 294, 308
 - polymer-supported 34
 - scandium tris(dodecyl sulfate) 33
 - Schotten-Baumann procedure 376
 - SCW, *see* supercritical water
 - SDS, *see* sodium dodecyl sulfate
 - second-order rate constants 262
 - secondary alcohols 87
 - selectivity
 - absorption 278
 - hydrogenation 110
 - in water 18-21
 - syn 298
 - self-assembly, rod-coil molecules 179
 - separation

- catalysts 106, 135–137, 191
- water-induced phase 401, 402
- Shikimic acid 373
- sigmatropic reaction, monomolecular 230
- sildenafil citrate 374, 375
- silica gel-supported scandium 34–36
- silica-grafted amines 68
- silicates, alkaline ion-exchange 58
- silicon enolate 41
- silyl enol ether 32, 309
- single-walled carbon nanotubes (SWNTs) 225
- sodium carboxylate 252
- sodium dodecyl sulfate (SDS) 120, 130, 165, 263, 264
- soft heteroatom-based nucleophiles 211
- soft ligands 75
- 'sole solvent' 32–36
- solid-liquid processes 65–70
- solubility
 - benzene in HTW 333
 - biphasic systems 394
 - Hildebrand parameter 253
 - *n*-alkenes 399
- solutes, organic 233
- solutions
 - aqueous sugar 319–324
 - chemical kinetics 336
 - solvent-free epoxidation 79
- solvents
 - acceptor number 246
 - aprotic 141, 236
 - green 232–234, 385–408
 - 'greenest' 142
 - hydrogen-bonding 244
 - mixed aqueous 378
 - 'on water' conditions 209
 - organic 209, 210
 - polar organic 115
 - protic 235, 236
 - 'sole solvent' 32–36
 - volatile organic compounds (VOCs) 1, 2
 - water 1–29
- solvophobicity 253
- sonochemical reactions 285
- Sonogashira coupling 182–184
- Sonogashira cross-coupling 276
- Sonogashira reaction 181–186
- 'stabilized carbenes' 16
- stable free radical 87, 91–94
- standard chemical potentials 237, 238
- starches 77, 78
- statins 366–369
- Staudinger-type conditions 367
- stereoselectivity
 - C–C-bond-forming reactions 53
 - 'on water' reactions 214
- Stille coupling 180, 181
 - aqueous media 59
- stirring 207, 208
 - multiple 400
- stoichiometric reagents 75
- stripping 395
- styrene 70
 - cyclopropanation 165
- styrene-based polymers 51
- substituent effects 246
- substituents, electron-donating 88
- substituted α -phenylcinnamic acid derivatives 283
- substituted olefins 86
- substituted tetrazines 245
- substitutions
 - allylic 186
 - electrophilic aromatic 306–308
 - nucleophilic 224, 225
- substrates
 - benchmark 129, 130
 - highly polar 122
 - hydrophilic 40, 41
- sucrose 313–317
 - conformational behavior 313
- sugar aldehydes 305, 306
- sugar solutions, aqueous 319–324
- sugars
 - aza 311, 312
 - chain-elongated 299
 - indium-mediated allylation 298
 - reducing 292
 - unprotected 295, 296
 - see also saccharides
- sulfates, dodecyl 120, 130, 165, 263, 264
- sulfides
 - β -hydroxy 282
 - prochiral 97
- sulfonic acids 53
- sulfoxidation 96, 97
 - enantioselective 97
- sulfur ylide, chiral 63
- superabsorbents 78
- superacids 355
- supercritical carbon dioxide 1
- supercritical water (SCW) 267, 331–355
- supported bases 58
- supramolecular reactor 179
- surfactants
 - aggregates 261–266
 - Bronsted acid catalysts 45–51
 - CTAB 37, 130, 133, 263, 264

- glycamine-based 311
 - SDS 120, 130, 165, 263, 264
 - suspensions, aqueous 207
 - Suzuki coupling 66, 176
 - aqueous media 59, 60
 - microwave-assisted 274
 - Suzuki–Miyaura coupling 215
 - Suzuki–Miyaura reaction 173–180
 - Suzuki reaction 377, 378
 - SWNTs, *see* single-walled carbon nanotubes
 - symmetrical fatty diketones 297
 - syn* selectivity 298
 - syngas 398, 402
- t**
- Tamiflu 372–374
 - TAML, *see* tetraamido macrocyclic ligand
 - tandem bis-aldol reaction 281
 - tank reactor 400
 - taxol 162
 - telomerization
 - butadiene 404
 - dienes 170, 171
 - palladium-catalyzed 317
 - TEMPO (2,2,6,6-tetramethylpiperidinoxyl) 87, 91–94
 - terminal alkynes 181, 182, 185
 - terminal olefins 86
 - tethered complex 132
 - tetraamido macrocyclic ligand (TAML)
 - 76–78
 - tetrafluoroborates, arene diazonium 177
 - tetrahedral structure 333
 - tetrahydrofuran 342, 348
 - tetranuclear complex 110
 - tetrazines 245
 - TfOH 38
 - theoretical studies
 - HTW 335–339
 - ‘on water’ conditions 226, 227
 - transition states 226
 - thermal conductivity, water 332
 - thermoresponsive catalysts 91
 - thiamine pyrophosphate 15, 16
 - thiazolium salt 16
 - thiolysis 282
 - trans*-stilbene 248
 - transaminations 14, 15
 - transfer
 - Gibbs energy 241
 - intra-complex 4
 - transfer hydrogenation 105, 123–137
 - achiral 124–126
 - asymmetric 126–135
 - transition metal-catalyzed 124
 - transition metals
 - cross-coupling reactions 215, 216
 - transfer hydrogenation 124
 - transition states
 - approximate theory 226
 - chelating 298
 - cyclic 303, 304
 - geometries 21–25
 - participation of water 141, 142
 - polar 278
 - trapping reagent 247
 - treatment plant, biological effluent 363
 - tributylphosphine 391
 - triflates 173–180
 - Lanthanide 258
 - scandium 34, 294, 308
 - trihydroxyalkyl-substituted furan
 - derivatives 293
 - triphenylphosphine 391
 - trisulfonated 396
 - trisulfonated triphenylphosphine 396
 - Tsuji–Trost reaction 186–188
 - tubular reactors 400
 - turnover catalysis 14
 - 12 Principles of Green Chemistry 152, 232, 399
 - tyrosine kinase inhibitors 178
- u**
- UCC process 403
 - Ullmann–Goldberg reaction 286
 - ulosonic acids 322
 - ultrasound, non-conventional energy
 - sources 285, 286
 - ultraviolet (UV) light 287
 - unconjugated alkenes and alkynes, coupling
 - reactions 163–170
 - unprotected sugar 295, 296
 - unsaturated carbonyl compounds 213–215
 - α,β -unsaturated derivatives, 1,4-addition
 - 171, 172
 - unsaturated derivatives, polyfunctional
 - 167–170
 - α,β -unsaturated ketones 347
 - unsaturated polymers 112
 - unsymmetrical diketones 297
 - uridylyridine 7
- v**
- variable hydrophobicity 240
 - vesicle-forming amphiphile 264
 - Viagra 374, 375
 - vicinal dihydroxylation 78

- vinyl ether, allyl 231
 vinyl iodides 173–180
 vinylation 158–161
 viscosity, water 332
 volatile organic compounds (VOCs) 1, 2
- W**
- water
 – -based enzymatic processes 363–374
 – bulk chemicals 385–408
 – chiral Lewis acid-catalyzed asymmetric reactions 36–44
 – coordination to metals 138, 139
 – coupling reactions 151–206
 – extreme conditions 331–361
 – functionalization of carbohydrates 291–330
 – green acid catalysis 31–54
 – green bases 57–73
 – green oxidation 75–103
 – green reduction 105–149
 – H–D exchange 141, 142, 355
 – high-temperature, *see* high-temperature water
 – hydrophobic effect. *see* hydrophobic effect
 – Lewis acids 31–36
 – mole fraction 238
 – oil–water interface 226
 – ‘or water’ conditions 207–228
 – participation in transition states 141, 142
 – pharmaceutical applications 363–383
 – pure 44–53
 – selectivities in 18–21
 – solvent for green chemistry 1–29, 232–234
 – superabsorbents 78
 – supercritical 267, 331–355
 water–cosolvent media 316
 water-facilitated catalyst separation and recycle 135–137
 water-in-oil microemulsions 266
 water-induced phase separation 401, 402
 water-insoluble reactants 207
 water-soluble ligands 76, 77, 106–108
 water-soluble phosphinenes 174
 water-soluble phosphines 114
- X**
- XANTPHOS 391
- Y**
- Yamamoto–Yanagisawa catalyst 155
 yield
 – catalysis 32–53
 – chain elongation 300
 – C-glucosidation 307
 – *N*-glycosylation 312
 ylide, sulfur 63
- Z**
- zeolites 96
 – cation-exchanged 70
 zinc-mediated allylation 153

Index

- a**
- abiotic degradation 290
 - anions 287
 - absorption chillers 221, 222
 - single-effect 222
 - abstraction
 - thermal 67
 - acidic impurities 117
 - acids
 - acidic oxides 55
 - biphasic acid scavenging utilizing ionic liquids 300
 - Brønsted 53, 101
 - catalysts 55, 329
 - Lewis 67, 101
 - methanesulfonic 110
 - polylactic 93
 - protonated acidic ILs 128
 - protonic 55
 - supported 55
 - acrylate
 - methyl 329, 330
 - actinides 142
 - activation
 - transition metal complexes 68
 - active enzymes 153
 - activity
 - structure–activity relationships 236, 261
 - aerobic biodegradation
 - testing procedures 267
 - air gap spinning 132
 - (*S*)-(+)-alapyridain 96
 - aliphatic hydrocarbons 145
 - alkoxides
 - metal 55
 - 1-alkoxymethyl-3-hydroxypyridinium salts 285
 - 1-alkyl-3-methylimidazolium-based ionic liquids 323
 - 1-alkyl-3-methylimidazolium halide salts 8, 11, 12
 - 1-alkyl-3-methylimidazolium ionic liquids 194
 - alkylation
 - Friedel–Crafts 54
 - *N*-methylimidazole 323, 324
 - alkylimidazolium cations 227
 - alkyls
 - metal 55
 - alkyltrimethylammonium salts 286
 - allyl chloride 74
 - alumina membranes
 - porous 167
 - amines
 - tertiary 300
 - Ammonoeng 110, 153
 - ammonia
 - solubility 227
 - ammonium compounds 282
 - ammonium salts 254, 286
 - anion hydrolysis 81
 - anionic moieties 264
 - anions
 - biotically degradable 287
 - dimethylphosphate 227
 - ionic liquids 241
 - non-halide 28
 - antimicrobial properties
 - ionic liquids 254
 - applications
 - COSMO-RS 173
 - HMF 98
 - IL lubricants 217
 - ILs in electrolyte systems 191
 - aquatic test systems 243

- aqueous nitrate media 142
- aqueous two-phase system (ATPS) 151
- aromatic-aliphatic separation 145, 156
- aromatic hydrocarbons
 - extraction/separation 145, 156
- atom economy/efficiency 7, 318
- ATPS, *see* aqueous two-phase system
- auxiliary substances
 - 12 principles of green chemistry 10
- b**
- bacteria 243
- ball-on-disc tribotester 204
- baseline toxicity 292
- BASF BASIL process 49, 299
- batch synthesis 17
- batches
 - technical-grade 111
- bath
 - electroplating 195
- benzene
 - monoalkyl- 57
 - 1,2,4-trichloro- 78
- benzylalkyldimethylammonium salts 286
- bilayer
 - lipid- 262
- bioavailability 258
 - pollutants 261
 - xenobiotics 292
- biochemical oxygen demand (BOD) 267
- biodegradability
 - aerobic testing procedures 267
 - ammonium compounds 282
 - IL anions 269
 - imidazolium-based ionic liquids 270
 - imidazolium compounds 283
 - ionic liquids 34, 265, 293
 - phosphonium compounds 282
 - pyridinium-based ionic liquids 278
 - tested ionic liquids 244
 - testing 266
- biodegradation 235
 - primary 277, 281
- bioethanol
 - cellulosic 135
- biological test systems 240
- biomass fractionation 134
- biotically degradable anion 287
- biphasic acid scavenging utilizing ionic liquids (BASIL) 300
- biphasic catalysis 72
 - liquid-liquid 56
- biphasic reaction systems 46
 - IL-scCO₂ 75
- biphasic separation
 - hydrophobic compounds 141
- bis(trifluoromethanesulfonyl)amide ionic liquids 197
- BOD, *see* biochemical oxygen demand
- borate
 - trimethyl 157
- boundary friction 209
- bromide
 - lithium 222
- Brønsted acids
 - homogeneous 101
 - ionic liquids 53
- bubbler
 - oil 9
- 1-butene hydroformylation 84
- 1-butyl-4-(dimethylamino)pyridinium head group 264
- 1-butyl-3-methylimidazolium halide salts 9
- c**
- cancerogenicity 263
- capital-dependent costs 116
- carbene complexes 68
- carbon dioxide
 - CO₂ production (biodegradability parameter) 267
 - Henry constant 174
 - separation 165
 - supercritical
 - scCO₂ 75
- carbon disulfide 125
- catalysis
 - biphasic 72
 - heterogeneous 77
 - hydroformylation 79
 - liquid-liquid biphasic 56
 - multiphase 75
 - nanoparticle and nanocluster 75
 - SILP 46
 - SILP transition metal 71
 - transition metal 65
- catalysts
 - acidic 55, 329
 - immobilization 72
 - interaction with ionic liquids 67
 - ionic liquids 51
 - ionic solutions 70
 - palladium 76
 - platinum 73
 - recycling 72
 - SCILL 78
 - solubility and immobilization 80
- cationic head groups 240, 257

- cations
 - alkylimidazolium 227
 - 1,3-dialkylimidazolium 69
 - ionic liquid 288
 - metabolizable 287
 - organic 195
 - CED, *see* cumulative energy demand
 - cells
 - solar cells 198
 - cellulose
 - derivatives 134
 - dissolution and processing 123
 - global production 99
 - pulp 127
 - regeneration 131
 - cellulose solutions
 - rheological behavior 129
 - cellulosic bioethanol 135
 - cellulosic fibers 131, 133
 - centrifugal extractor 168
 - CF, *see* cost factor
 - chelate extraction 144
 - chemical feedstock
 - cellulose 125
 - chemical reactions
 - reactions 18
 - chemical stability 44
 - chemical structures
 - T-SAR analysis 237
 - chemicals
 - natural organic 123
 - non-persistent 266
 - platform 93
 - REACH legislation 15, 235, 293
 - chillers
 - absorption 221, 222
 - chlorides
 - allyl 74
 - hemihydrate 12
 - 1-H-3-methylimidazolium 301
 - chloroaluminate 51, 68
 - clay minerals 258
 - “CO₂ Headspace” test 286
 - coefficient of performance (COP) 223, 226
 - colorless ionic liquids 31
 - commercial lubricants 210
 - complex viscosity 129
 - complexes
 - Cu⁺ 144
 - metal–carbene 68
 - transition metal 65, 68
 - compressibility
 - ionic liquids 210
 - Concentration Addition (CA) concept 259
 - concentration effect 107
 - condensation
 - fructose 100
 - conductive heating preparation 8, 9
 - conductivity
 - electric 215
 - specific 194, 196, 197
 - conductor-like screening model for real solvent (COSMO-RS) method 47, 173
 - contact measurement
 - steel–steel 204
 - contactor
 - rotating disc 169
 - continuous flow synthesis 19
 - continuous processing 114
 - continuous single-phase process 101
 - conventional heating 11
 - conversion efficiency 199
 - conversion of renewable resources 93
 - cooling efficiency 223, 226
 - copper complexes 144
 - corrosion 215, 225
 - cost assessment
 - BASF BASIL process 308
 - continuous processing of HMF 115
 - extraction of aromatic hydrocarbons 146
 - cost factor (CF) 320, 332
 - cotton 133
 - coupling reactions
 - Heck 76
 - Suzuki 76
 - “cradle-to-grave” life-cycle assessment (LCA) 317, 323
 - cross-solubility 162
 - crown ether 143
 - crystal structures
 - dimethylimidazolium chloride hemihydrate 13
 - crystallization behavior 224
 - cumulative energy demand (CED) 319
 - customer benefit 303
 - cyclopentadiene 329, 330
 - cytotoxicity 263
 - and hydrophobicity 262
- d**
- DDT (dichlorodiphenyltrichloroethane) 265
 - decolorization 5
 - ionic liquids 31
 - SWOT Analysis 31
 - decomposition temperature 225

- degradation
 - abiotic 290
 - anions 287
 - biodegradation, biodegradability 277
 - UV 294
 - dehydration 105
 - denitrogenation 158
 - density 196
 - DEPP, *see* diethoxyphenylphosphine
 - derivatization 6
 - design
 - inherently safe ionic liquids 235
 - separation processes 172
 - sustainable ionic liquids 238
 - desulfurization
 - fuels 158
 - oxidative 162
 - device stability 192
 - dialkoxyphenylphosphines 300
 - 1,3-dialkylimidazolium cation 69
 - dialkylimidazolium salt 111
 - diazabicycloundecane 128
 - dichlorodiphenyltrichloroethane (DDT) 265
 - dichloromethane 31
 - die-away tests 269
 - Diels–Alder reaction 329, 330
 - diesel
 - extraction 159
 - diethoxyphenylphosphine (DEPP) 303
 - diethylphosphate 269
 - dimer selectivity 73
 - N,N*-dimethylacetamide 104
 - 4-(dimethylamino)pyridinium compounds 284
 - dimethylcyclohexylammonium hydrogensulfate 78
 - dimethylimidazolium chloride hemihydrate 13
 - dimethylphosphate anion 227
 - dissolution
 - cellulose 127, 137
 - dissolved organic carbon (DOC) 267
 - dissolved organic matter (DOM) 257
 - distillation 44
 - extractive 153
 - product isolation 70
 - distribution coefficient
 - aromatic–aliphatic separation 147
 - disulfide
 - carbon 125
 - DOM, *see* dissolved organic matter
 - drop size 169
 - drugs 152
 - dry/wet spinning 132
 - DSSC, *see* dye-sensitized solar cells
 - dye-sensitized solar cells (DSSC) 198
 - dynamic viscosity 194, 196
- e**
- E*-factor 7, 18
 - eco-efficiency
 - analysis 299
 - label 313
 - portfolio 309
 - ECO method 317, 319, 334
 - ecological fingerprint 307
 - economic evaluation
 - cost assessment 146
 - ecotoxicity
 - ionic liquids 238, 239, 291
 - surrounding medium 257
 - EDPP, *see* ethoxydiphenylphosphine
 - EF, *see* energy factor
 - efficiency
 - atom economy 7
 - atom 318
 - cooling 223
 - eco- 299, 309
 - energy 18
 - extraction 18
 - power conversion 199
 - EHF, *see* environmental and human health factor
 - elastic liquids 20
 - elastohydrodynamic friction 209
 - electric conductivity 215
 - electrochemical stability 45, 196
 - electrochemical treatment 294
 - electrolyte properties
 - ionic liquids 193
 - electrolyte systems 191
 - electron-rich heteroatoms 51
 - electrophilic substitution 54
 - electroplating bath 195
 - endo:exo ratio 330
 - energy consumption 304
 - energy demand
 - cumulative 319
 - energy efficiency 18
 - energy factor (EF) 320, 330
 - environment 233
 - environmental and human health factor (EHF) 320, 332
 - environmental separation 158
 - enzymes 242, 255
 - active 153
 - equilibrium

- vapor-liquid 227
- ethoxydiphenylphosphine (EDPP) 303
- 1-ethyl-3-methylimidazolium ionic liquids 196
- evaluation 321
- chemicals
 - REACH legislation 15
- economic
 - cost assessment 146
- exchange resins 55
- extraction 141
 - aromatic hydrocarbons 145
 - chelate 144
 - efficiency 142
 - extractive distillation 153
 - four-stage 159
 - liquid-liquid 141
 - metals 141
 - proteins 151
 - radioactive metals 142
 - reactive 116
- extractor
 - centrifugal 168

f

- feedstock
 - chemical 124
 - petrochemical 93
 - solubility 79
- fibers
 - cellulosic 131, 133
- filtration
 - membrane 294
 - nano- 164
- fingerprint
 - ecological 307
- fluidity 197
- fluoride-free ionic liquids 208, 209
- four-stage extraction 159
- fractionation
 - biomass 134
- friction 206, 209
- friction coefficient 205, 206
- Friedel-Crafts alkylation 54
- Friedel-Crafts reactions 47, 55
 - SILP catalysis 57
- fructose 104
 - concentration effect on HMF manufacture 107
 - condensation 100
 - global production 99
- fuels
 - denitrogenation/desulfurization 158
- functionality

- ionic liquids 143
- functionalized ionic liquids 165

g

- gases
 - separation 164
- gasoline
 - extraction 159
- global warming potential (GWP) 306, 319
- glucose
 - global production 99
 - reactivity 112
- glycol
 - oligoethylene 167
- greases
 - ionic 216
- green chemistry
 - 12 principles of 3, 235
- green engineering
 - ionic liquids 137
- green separation processes 139
- green synthesis 1
 - organic 41
- groups
 - head 197
- GWP (global warming potential) 306, 319

h

- halide salts
 - 1-alkyl-3-methylimidazolium 8, 12
 - 1-butyl-3-methylimidazolium 10
- halides 74. *see also* chlorides
- metal 55
- halogen-containing ionic liquids 81
- HDS, *see* hydrodesulfurization
- head groups
 - biodegradability 269, 283, 285
 - 1-butyl-4-(dimethylamino)pyridinium 255
 - cationic 197, 240
- heat exchanger 223
- heat transfer 224
- heating
 - conductive 8
 - conventional 11
 - microwave 15
- Heck coupling reactions 94
- hemihydrates
 - dimethylimidazolium chloride 13
- Henry constant 174
- Hertz contract stress 207
- heteroatoms
 - electron-rich 51
- heterogeneous catalysis 77

- hexafluorophosphate ionic liquids 208, 215
 - hexoses 105
 - HMF, *see* 5-hydroxy-methylfurfural
 - homo-substituted dialkylimidazolium salt 111
 - homogeneous Brønsted acids 101
 - homogeneous Lewis acids 101
 - human health
 - environmental and human health factor 320
 - humines 99
 - hydrocarbons
 - aliphatic 145, 156
 - aromatic 145, 156
 - hydrodesulfurization (HDS) 158
 - hydrodynamic lubrication 209
 - hydroformylation 81
 - 1-butene 84
 - catalysis 79
 - 1-octene 82
 - SILP catalysis 83
 - hydrogensulfate
 - dimethylcyclohexylammonium 78
 - hydrolysis
 - anion 81
 - hydrophilic ILs 5
 - purification 28
 - hydrophobic compounds
 - biphasic separation 141
 - hydrophobic ILs 5, 28
 - hydrophobicity and cytotoxicity 262
 - hydrosilylation 73
 - 5-hydroxymethylfurfural (HMF) 93, 94
 - applications 98
 - continuous processing 114
 - derivatives 96
 - fructose concentration effect 107
 - manufacture 99, 105
 - oxidation products 97
 - reduction products 98
 - temperature effect on HMF manufacture 106
 - water effect on HMF manufacture 108
 - hygroscopic ionic liquids 223
- i*
- IL, *see* ionic liquids
 - imidazole ring 284
 - imidazolium
 - biodegradability 283
 - imidazolium-based ionic liquids 256
 - biodegradability 270
 - fluoride-free 208
 - immobilization
 - catalysts 72, 80
 - transition metal complexes 65
 - impurities
 - acidic 117
 - in situ* formation
 - carbene complexes 68
 - Independent Action (IA) concept 259
 - industrially implemented IL processes 299
 - inherently safe ionic liquids 235
 - intrinsic safety aspects 295
 - inulin 99, 112
 - ionic catalyst solutions 70
 - ionic greases 216
 - ionic ligands 66
 - 1-alkyl-3-methylimidazolium 194, 323
 - anions 241, 265
 - antimicrobial properties 254
 - bioavailability 258
 - biodegradability 34, 265, 293
 - biphasic acid scavenging 300
 - biphasic reaction systems 46
 - bis(trifluoromethanesulfonyl)amide 197
 - Brønsted acids 52
 - catalytic 51
 - cellulose dissolution 123, 127
 - cellulose processing 123, 129
 - chemical and thermal stability 44
 - colorless 31
 - compressibility 210
 - conversion of renewable resources 93
 - corrosion behavior 225
 - crystallization behavior 224
 - desulfurization 158
 - ecotoxicity 239, 291
 - electrochemical stability 45
 - electrolyte properties 191, 193
 - environmental aspects 233
 - 1-ethyl-3-methylimidazolium 25, 195, 208
 - extractive distillation 155
 - fluoride-free 208, 209
 - fractionation of biomass 134
 - Friedel–Crafts reactions 55
 - functionalized 45, 165
 - green engineering 137
 - green organic synthesis 41
 - green separation processes 139
 - 1-H-3-methylimidazolium chloride 301
 - halogen-containing 81
 - heterogeneous catalysis 77
 - hexafluorophosphate 208, 215
 - HMF manufacture 99, 105
 - hydroformylation catalysis 79
 - hydrophilic 5
 - hydrophobic 5
 - hygroscopic 223

- IL-based spinning process 132
- IL-scCO₂ biphasic systems 75, 82
- IL-supported membranes 166
- imidazolium-based 257, 270
- inherently safe 235
- interaction with catalysts 53
- LCA 327
- lubricants 203
- metabolic pathways 288
- 1-methylimidazole 303
- microwave irradiation-promoted synthesis 15
- nanoparticle catalysis 75
- non-toxic 34
- pH values 109
- phase behavior of IL-water systems 226
- phosphite ligands 81
- polarity 65
- precursors 303
- product isolation 49
- protonated 128, 334
- pure 214, 225
- purification 28, 109
- pyridinium-based 160, 278
- reactive 51
- recycling 131
- SCILL 78
- SILP 46
- solubility 77
- structural moieties 117
- substitutes for molecular solvents 315
- sustainable 238
- synthesis 5, 322
- task-specific 143
- tested for biodegradability 244
- tetrafluoroborate 208
- thermomorphic 75
- transition metal catalysis 65
- ultrasonic irradiation-promoted synthesis 20
- "unusual" 111
- vapor pressure 43
- water-insoluble 111
- ionic liquids 3
- irradiation
 - microwave 15
 - ultrasonic 20
- isobutyl ketone
 - methyl 101
- isopropylation 54, 58
- isothermal temperature stability test 212

j

- jet reactor 302

k

- kaolinite-containing soils 258
- ketones
 - methyl isobutyl 101

l

- label
 - eco-efficiency 313
- lactose 113
- lanthanides 142
- large-scale processing 123
- LCA. *see* life-cycle assessment
- lead structures 238
- legislation
 - REACH 15
- Lewis acids 67
 - homogeneous 101
- life-cycle assessment (LCA) 300, 312, 316, 318
 - "cradle-to-grave" 317, 323
 - methodology 318
- ligands
 - ionic 66
 - neutral 143
 - phosphite 81
- lipid bilayer 262
- liquids
 - elastic 20
 - ionic liquids 20
 - liquid-liquid biphasic catalysis 56
 - liquid-liquid biphasic organic reactions 46
 - liquid-liquid extraction 141
 - non-Newtonian 129
 - separation 141, 144
 - vapor-liquid equilibrium 227
- lithium bromide 222
- long side chains 283
- loop reactor 74
- loss modulus 130
- lubricants 203
 - commercial 211
 - hydrodynamic 209
 - thin films 210, 217
- Lyocell 133
 - process 126

m

- magnetic follower 9
- maltose 113
- mannose 113
- manufacture
 - HMF 99, 105
- market prices
 - HMF starting materials 99

- mass transfer 171, 224
 - melting point 214, 224
 - membranes
 - combination with separation 163
 - filtration 294
 - IL-supported 166
 - membrane–water coefficients 262
 - porous alumina 167
 - MEMS (microelectrochemical–mechanical systems) 217
 - metabolizable cations 287
 - metals
 - alkoxides 55
 - alkyls 55
 - extraction 141
 - halides 55
 - metal–carbene complexes 68
 - radioactive 142
 - transition metal 65
 - metathesis 5, 70
 - methanesulfonic acid (MSA) 110
 - methanol
 - separation from TMB 156
 - methyl acrylate 329, 330
 - methyl isobutyl ketone 101
 - 1-methylimidazole 303
 - N*-methylimidazole
 - alkylation 323, 324
 - 1-*H*-3-methylimidazolium chloride ionic liquid 301
 - N*-methylmorpholine *N*-oxide (NMMO) 126
 - spinning process 127
 - microelectrochemical–mechanical systems (MEMS) 217
 - microwave heating 15
 - microwave irradiation
 - IL synthesis 15
 - simultaneous use with ultrasonic irradiation 23
 - microwave-promoted synthesis
 - SWOT analysis 22
 - microwave reactors 17
 - mixed film friction 209
 - mixture toxicity 264
 - modes of toxic action 261
 - moieties
 - anionic 264
 - molecular interaction 65
 - molecular solvents
 - LCA 327
 - substitutes 315
 - molten organic salts 126
 - monoalkylbenzene 57
 - monosaccharides 99
 - Monsanto/Keillog technology 54
 - MSA, *see* methanesulfonic acid
 - multiphase catalysis 75
 - multiphase systems 82
 - mutagenicity 263
 - MX waste 18, 28
- n**
- nanofiltration 164
 - nanoparticle and nanocluster catalysis 75
 - naphtha cracker 146
 - narcosis 292
 - natural organic chemicals 123
 - neutral ligand 143
 - nitrate
 - aqueous media 142
 - “non-green” attributes 3
 - non-halide anions 28
 - non-Newtonian liquids 129
 - non-persistent chemicals 266
 - non-toxic ionic liquids 34
 - nonane 46
 - nucleophilic attack 226
- o**
- 1-octene
 - hydroformylation 82
 - ODP (ozone depletion potential) 310
 - OH shift 128
 - oil bubbler 9
 - olefin–paraffin separation 155, 168
 - oligoethylene glycol 167
 - oligomerization 73
 - “one-pot” synthetic route 5
 - opportunities
 - SWOT analysis 8
 - optimization 321
 - organic carbon
 - dissolved 267
 - organic cations 195
 - organic chemicals
 - natural 123
 - organic compound–water separation 156
 - organic matter
 - dissolved 257
 - organic reactions
 - liquid–liquid biphasic 46
 - product isolation 49
 - organic salts
 - molten 126
 - oxidation
 - degradation techniques 292
 - products of HMF 97
 - oxidative desulfurization 162

- oxygen demand
 - biochemical 267
 - theoretical 268
- ozone depletion potential (ODP) 310
- P**
- paraffin
 - olefin–paraffin separation 155, 168
- PCR (polymerase chain reaction) 283
- Pd-catalyzed Suzuki coupling 76
- penicillin 152
- performance
 - coefficient of 223, 226
- persistency 293
- personnel-dependent costs 116
- petrochemical feedstock 93
- pH value 109
- phase behavior
 - IL–water systems 226
- phase change 222
- phosphines
 - dialkoxyphenyl- 300
- phosphite ligands 81
- phosphonium compounds 282
- platform chemicals 93
- polarity
 - ionic liquids 65
- pollutants
 - bioavailability 261
- polylactic acid 93
- polymerase chain reaction (PCR) 283
- porous alumina membranes 167
- portfolio
 - eco-efficiency 309
- pour point 213
- power conversion efficiency 199
- pressure
 - vapor pressure 43
- pretreatment
 - supports 58
- primary biodegradation 277
- 12 principles of green chemistry 3, 235
- processes
 - BASF BASIL 49, 299
 - cellulose dissolution and processing 123
 - continuous 114
 - continuous single-phase 101
 - green separation 139
 - industrially implemented 299
 - large-scale 123
 - Lyocell 126
 - NMMO 126
 - separation (desgin) 172
 - spinning process 132
 - viscose 125
- product isolation 49, 70
- “PRODUCTIVELY” 6
- propionoxymethylfurfural 96
- proteins
 - extraction 151
- protonated acidic ionic liquids 128
- protonated diazabicycloundecane 128
- “protonated” ionic liquids 334
- protonic acids 55
- Pt-catalyzed hydrosilylation 73
- pulp
 - cellulose 127
- pure ionic liquids 214
 - viscosity 225
- purification
 - 1-alkyl-3-methylimidazolium halide salts 12
 - hydrophilic/hydrophobic ILs 28
 - ionic liquids 28
 - routes 5
 - SWOT analysis 29
- purity
 - ionic liquids 109
- pyridinium 284
- pyridinium-based ionic liquids 278
- pyridinium-containing ILs 160
- Q**
- quantitative structure–activity relationships (QSAR) 261
- quasi-Fermi level 200
- quaternization 5, 18
- R**
- radioactive metals 142
- rayon 133
- RDC, *see* rotating disc contactor
- REACH (Registration, Evaluation, Authorization and restriction of CHemicals) legislation 15, 235
- reactions
 - alkylation 323, 324
 - anion hydrolysis 81
 - biphasic 46
 - condensation 100
 - coupling reactions 76
 - decolorization 5, 31
 - dehydration 105
 - denitrogenation 158
 - desulfurization 158, 162
 - Diels–Alder 329, 330
 - electrophilic substitution 54
 - extraction 116

- Friedel-Crafts 55
 - Friedel-Crafts alkylation 54
 - hydroformylation 79
 - hydrosilylation 73
 - isopropylation 54, 58
 - metathesis 70
 - oligomerization 73
 - organic reactions 49
 - oxidation 97
 - oxidative desulfurization 162
 - purification 31
 - quaternization 5, 18
 - reduction 97
 - ring-closing metathesis 70
 - separation 139
 - synthesis 31
 - thermal abstraction 67
 - reactive extraction 116
 - reactive ionic liquids 51
 - reactivity
 - glucose 112
 - reactors
 - jet 302
 - loop 74
 - microwave 17
 - recycling
 - catalysts 72
 - ionic liquids 131
 - solvent 116
 - reduction products of HMF 97
 - regeneration
 - cellulose 131
 - renewable resources
 - conversion 93
 - resins
 - exchange 55
 - restriction
 - chemicals
 - REACH legislation 15
 - rheological behavior
 - cellulose solutions 129
 - ring-closing metathesis 70
 - rotating disc contactor (RDC) 169
- S**
- saccharides 93, 112, 113. *see also* sugars
 - fructose 105
 - glucose 112
 - hexoses 105
 - inulin 112
 - mono- 99
 - safety aspects
 - intrinsic 295
 - salinity 258
 - salts
 - 1-alkoxymethyl-3-hydroxypyridinium 285
 - 1-alkyl-3-methylimidazolium halide 9, 12
 - alkyltrimethylammonium 286
 - ammonium 254, 286
 - benzylalkyldimethylammonium 286
 - 1-butyl-3-methylimidazolium halide 10
 - dialkylimidazolium 111
 - molten organic 126
 - scar diameter 206
 - scavenging
 - biphasic acid 300
 - scCO₂ 75, 82
 - scenario analysis 311
 - SCILL (solid catalyst with ionic liquid layer) 78
 - selectivity
 - aromatic-aliphatic separation 147
 - dimer. 73
 - separation
 - aromatic-aliphatic 145, 156
 - biphasic 141
 - CO₂ 165
 - combination with membranes 163
 - environmental 158
 - functionalized ILs 165
 - gases 164
 - liquids 141
 - olefin-paraffin 155, 168
 - organic compound-water 156
 - process design 172
 - processes 139
 - TMB-methanol 156
 - shear rate 129
 - shear viscosity 129
 - SHX, *see* solution heat exchanger
 - side chain effect 243
 - side chains
 - long 283
 - SILP catalysis 46, 70
 - Friedel-Crafts 57
 - hydroformylation 83
 - transition metal 71
 - single-effect absorption chiller 222
 - single-phase process
 - continuous 101
 - smectite-containing soils 258
 - soil types 258
 - solar cells 198
 - dye-sensitized 198
 - solid catalyst with ionic liquid layer (SCILL) 78
 - solid-phase batch synthesis 17
 - solubility
 - ammonia 227

- catalysts 80
- cross- 162
- feedstock 79
- ionic liquids 77
- transition metal complexes 65
- tunable 47
- solution heat exchanger (SHX) 223
- solution-phase batch synthesis 17
- solutions
 - cellulose 129
 - ionic catalyst 70
- solvent-free synthesis 334
- solvent recycling 116
- solvent-to-feed ratio (S/F) 154
- solvents
 - COSMO-RS method 47
 - molecular 315, 327
 - performance 330
 - selection tools 317
- specific conductivity 194, 197
- spinning process 123
 - IL-based 132
 - NMMO 127
- stability
 - chemical/thermal 44, 210, 225
 - device 192
 - electrochemical 45, 196
- starch 99
- starting materials
 - HMF manufacture 99
- steel-steel contact measurement 205
- storage modulus 130
- strengths, weaknesses, opportunities, threats (SWOT) analysis, *see* SWOT analysis
- stress
 - Hertz contract 207
- Stribeck curve 209
- structural moieties
 - ionic liquids 117
- structure-activity relationships 236
 - quantitative 261
- substitution
 - electrophilic 54
- substructural elements 291
- sugars 104, *see also* saccharides, fructose
 - global production 99
- sulfate
 - hydrogen- 78
- sulfolane 146, 147, 170
- supercritical CO₂, *see* scCO₂
- supported acids 55
- supported ionic liquid phase, *see* SILP
- supports
 - pretreatment 58
- sustainable ionic liquids 238
- SWOT analysis 8, 14
 - IL decolorization 31
 - microwave-promoted synthesis 18
 - purification of hydrophilic/hydrophobic ILs 29
 - simultaneous microwave and ultrasonic irradiation 23, 24
 - ultrasonic-promoted synthesis 22
- synthesis
 - batch 17
 - continuous flow 19
 - dialkoxyphenylphosphines 300
 - green 3
 - green organic 41
 - ionic liquids 322
 - microwave irradiation-promoted 15
 - microwave-promoted 18
 - solvent-free 334
 - ultrasonic irradiation-promoted 20, 22
- synthetic routes
 - ionic liquids 5
 - "one-pot" 5
- t**
- T-SAR concept 236
- task-specific ionic liquids (TSILs) 143
- technical-grade batches 111
- temperature effect on HMF manufacture 106
- temperature of thermal decomposition 225
- temperature stability test
 - isothermal 212
- tertiary amine 300
- "Test Kit" concept 236
- test organisms 242
- test systems
 - aquatic 243
 - biological 240
- tests
 - biodegradability 266, 267
 - "CO₂ Headspace" 286
 - die-away 269
- tetrafluoroborate ionic liquids 208
- theoretical oxygen demand (ThOD) 268
- thermal abstraction 67
- thermal decomposition temperature 225
- thermal stability 210, 225
 - ionic liquids 44
- thermomorphic ionic liquids 75
- thin films
 - lubricating 210, 217

"Thinking in terms of Structure–Activity Relationships" concept 236

threats

– SWOT analysis 8

TMB, *see* trimethyl borate

toluene

– isopropylation 54, 58

toxicity

– baseline 292

– cyto- 256

– dichloromethane 31

– ecotoxicity 257

– ionic liquids 291

– mixture 264

– modes of toxic action 261

toxicology 235

transition metal catalysis 65

– SILP 71

transition metal complexes 65, 68

tribotester

– ball-on-disc 204

1,2,4-trichlorobenzene 78

trimethyl borate 156

triphasic systems 46

TSILs, *see* task-specific ionic liquids

tunable solubility properties 47

two-phase system

– aqueous 151

U

ultrasonic irradiation 20

– simultaneous use with microwave irradiation 23

ultrasonic-promoted synthesis

– SWOT analysis 22

UNIFAC 173

"unusual" ionic liquids 111

UV degradation 294

V

vapor–liquid equilibrium (VLE) 227

vapor pressure

– ionic liquids 43

viscose process 125

viscosity

– complex 129

– dynamic 194

– pure ionic liquids 214, 225

– zero shear 129

viscosity index 213, 214

VLE, *see* vapor–liquid equilibrium

W

waste

– MX 18, 28

water

– effect on HMF manufacture 108

– membrane–water coefficients 262

– pollution 307

– separation from organic compounds 156

– water-insoluble ionic liquids 111

weaknesses

– SWOT analysis 8

wear 204

wear scar diameter 206

wear volume 205

WEEE logo 193

wet/wet spinning 132

working pairs 221

X

xenobiotics 259

– bioavailability 292

Z

zeolites 55

zero shear viscosity 129