

Index

a

- abbreviations 236
- absorption 53
 - carbon capture 65, 113
 - CASTOR pilot plant 221
 - CO₂ capture 113–154
 - CO₂ separation 69
 - coal power plants 45
 - gas separation 399f
 - membranes precombustion 432
 - physical 128
 - postcombustion 201–240, 381
 - precombustion 241–248
- absorption–desorption cycle 156, 201
- absorption–regeneration principle 59
- accountability 595f
- acetic acid foaming 228
- acid corrosion 533
- acid degradation 210
- acid gas recovery (AGR) 243
- acid gas separation
 - absorbents postcombustion 201
 - absorption materials 180
 - membranes precombustion 433
 - precombustion decarbonization 243
- acid–base reactions 156, 256
- acidification 5, 93, 103
- active oxides 483
- adsorption 444
- advanced power plant technology 11–45
- aerosol eliminator 213
- agglomeration 481
- aggregates 259
- air compressor 288
- air ingress 282, 410
- air leakage 409
- air preheater (APH) 214
- air ratio 24
- air separation unit (ASU)
 - carbonate looping 517
 - chemical looping 506
 - CO₂ separation 54
 - cryogenic CO₂ removal 269–291
 - membranes precombustion 432
 - oxyfuel process 277, 281ff, 405
- alkali metal carbonates 155
- alkaline earth cobaltites 323
- alkalinity 593f
- alkanolamines
 - absorption materials 157ff
 - CO₂ capture 115
 - CO₂ chemical absorption 137
 - CO₂ removal 57, 242
 - degradation 159
- alumina-based sorbents 241
- alumina membranes 389
- ambipolar conductivity 325, 331
- amines
 - absorbents postcombustion 201
 - CASTOR pilot plant 223ff
 - chemical looping 505
 - CO₂ chemical absorption 135ff, 140ff
 - CO₂ compression 528
 - CO₂ scrubbers 215
 - CO₂ separation 57
 - flue gas scrubbing 214
 - foaming tendencies 228
 - hindered 57
 - life cycle assessment 103
 - mixed 204
 - precombustion decarbonization 245
 - primary 203
- amino acid salts (AAS)
 - absorbents postcombustion 205
 - absorption materials 155, 167f
 - CO₂ capture 115
 - CO₂ chemical absorption 142
 - CO₂ separation 57

- pilot coal power plants 217
 - 2-amino-2-methyl-1-propanol (AMP)
 - absorbents postcombustion 205
 - absorption materials 158
 - CO₂ chemical absorption 139
 - foaming tendencies 229
 - Amisol 143
 - absorption materials 184, 191
 - precombustion decarbonization 245
 - ammonia
 - absorbents postcombustion 201, 207
 - absorption materials 162f
 - aqueous solutions 164
 - chemical looping 477
 - CO₂ compression 528
 - CO₂ separation 57
 - oxyfuel process 71
 - precombustion decarbonization 243
 - see also* chilled ammonia
 - ammonium hydrogencarbonate 165
 - ammonium solvents 194
 - ammonium thiosulfate 228
 - amorphous membranes 63
 - amorphous membranes
 - glassy phase polymers 376
 - silica 64, 341
 - sol-gel 319, 339
 - Antarctica ice storage 589
 - anthropogenic carbon flows 581
 - antifoam additives 225
 - antisublimation 115
 - aqueous CO₂-alkanolamine solutions 158
 - aqueous solubility 48
 - argon 58, 279, 546
 - aromatic poly(ether ether ketone) 351f
 - ash, chemical looping 510
 - ash 27, 510
 - atmospheric air feed 410
 - atmospheric CO₂ concentration 4, 45
 - see also* greenhouse gases
 - attrition 481
 - austenitic materials 32f
 - autothermal chemical looping reforming (CLR-a) 479
 - autothermal reformers (ATRs) 252, 437, 461f
 - auxiliary power demand
 - oxyfuel process 285f, 413
 - single-stage CO₂-selective membrane 448
 - staged/casscade CO₂-selective membrane 450
 - steam power plant 27
 - availability 12f
 - avoidance efficiency coefficient 91, 107
 - AZEP project 416
- b**
- bacteria 104
 - basalts carbon storage 575
 - BCND membranes 334
 - Benfield processes 161
 - bicarbonate 129, 137
 - bicine 228
 - binary water vapor-gas transport 369
 - biomass carbon storage 577, 590
 - blends foaming 228
 - block copolymer membranes 356, 372
 - block power station 12
 - boilers
 - oxyfuel process 271, 408
 - oxygen transfer membrane 423
 - steam power plant 23
 - boiling-out regeneration 201, 208
 - boiling points 185
 - Boltzmann constant 330
 - boundary conditions
 - CO₂-selective membrane 448f, 453
 - H₂-selective membranes 457
 - membranes precombustion 432ff
 - NGCC precombustion 467
 - Boundary Dam power station 230f
 - boundary membranes layer 300, 312
 - brittleness 389
 - brown coal 11, 27, 39
 - brownmillerites 322f, 332
 - BSCF membranes 407ff, 421
 - BSCF5582 membranes 324, 328
 - bubble column contactor 124
 - bulk CO₂ removal 115
 - burner cooling 65
- c**
- Ca-doped La₆WO₁₂ membranes 336
 - calciners 60, 514, 519
 - capacity
 - CO₂ transport 547
 - fossil carbon storage 592
 - oxygen carrier materials 483
 - pilot coal power plants 217
 - power plant technology 13
 - SEWGS 253
 - steam power plant 31
 - capillary membranes 309
 - capture *see* carbon capture, CO₂ capture
 - carbamate

- absorption materials 158, 161
- amino acid salts 167
- ammonia 162
- CO₂ chemical absorption 135 f
- CO₂ separation 57
- carbon capture 3–10, 65 f
 - absorption materials 175
 - membranes precombustion 3–10, 431–472
 - oxyfuel process 405
- carbon capture/storage (CCS) 3–10, 46 ff, 321, 525–572
 - chemical looping 506
 - electricity/renewable energies 104 f
 - fossil carbon 573
 - life cycle assessment 83–110
 - polymer membranes 352
 - postcombustion 383
- carbon dioxide *see* CO₂
- carbon dioxide hydrates 589
- carbon monoxide
 - CO₂ combustion 53
 - oxyfuel process 279
 - precombustion CO₂ capture 73
- carbon monoxide, water gas shift 442
- carbon reservoirs 5 f
- carbon steel 548
- carbon stripper 510 f
- carbon vapture 298
- carbonate absorbents 129, 133
- carbonate looping (CL) 55, 59, 504, 514 f
- carbonate minerals storage 583
- carbonation 575
- carbonation–calcination reaction 514
- carbon-based membranes 440
- carbon-containing chemicals 583
- carbonic acid
 - CO₂ transport 547
 - corrosion 533
 - fossil carbon storage 586
 - mineral sequestration 576
 - physical absorption 129
- carboxylic acids 143
- carcinogenic absorbents 144
- carnotization gap 38
- cascaded membrane process 314, 449
- CaSO₄ oxygen carrier materials 484
- CASTOR pilot plant 220
- catalysts
 - absorption materials 177
 - chemical looping 506
 - water gas shift 442
 - WGS_{MR}-H₂ 458
- see also* oxygen carriers
- catalytic activity
 - membranes CO₂ separation 322
 - precombustion decarbonization 249
 - water gas shift 261
- catenary anchor leg mooring (CALM) 555
- cation–anion combinations 193
- cellulose derivatives membranes 60, 388
- ceramic autothermal recovery (CAR) 320, 425
- ceramic membranes
 - CO₂ capture 115
 - CO₂ separation 63 f, 319
 - H₂-selective 453
 - materials transport 307
 - MPEC 333
 - oxyfuel process 406, 421
 - precombustion 440
 - separation 297
- cerate membranes 319
- cermet membranes 439
- chains, polymer 354
- characteristics
 - amines/ammonia 137
 - amino acids 142 f
 - MPEC 332
- charge carriers 331
- chemical absorption
 - CO₂ capture 131 f
 - CO₂ separation 54
 - CO₂ 56, 113–154
 - gas separation 399
 - materials 155–174
 - postcombustion 381
 - precombustion 432
- chemical bonding 243
- chemical carbon storage 583
- chemical expansion 323
- chemical looping combustion (CLC) 59
 - CO₂ separation 55, 473–524
 - coal power plants 45
 - membranes 320
 - power plants 505–524
- chemical looping gasification 480 f
- chemical looping materials 475–504
- chemical looping steam reforming (CLR-s) 479
- chemical looping with oxygen uncoupling (CLOU) 513
- chemical membranes composition 322
- chemical resistance 382, 387
- chemical structures 365
- chilled ammonia

- absorption materials 155, 163
- carbon capture 67
- chemical looping 477
- CO₂ compression 75
- CO₂ separation 57, 69
- pilot coal power plants 219
- circuit cooling systems 22
- circulating fluidized bed (CFB) 505–524
- classification numbers 432f, 439
- clathrates 589
- Clausius–Clapeyron equation 193
- climate change 3f
- closed loop absorber–desorber system 212
- closing natural carbon cycles 593f
- clustering analysis 362, 368
- CO₂ absorption 56
 - see also* absorption
- CO₂ capture 86, 113–154
 - absorbents postcombustion 201
 - chemical looping 475–524
 - coal power plants 45–55, 217f
 - life cycle assessment 84, 90
 - oxyfuel process 278, 283
 - polymer membranes 351
 - postcombustion process 381
- CO₂ compression 47, 74f, 527–540
- CO₂ emissions 527
 - see also* greenhouse gases
- CO₂ phase diagram 533, 588
- CO₂ pipelining 383
- CO₂ production
 - Boundary Dam power station 234
 - CASTOR pilot plant 221, 226
 - University of Regina test plant 236
- CO₂ purity 533f
 - see also* purity
- CO₂ removal
 - absorbents postcombustion 201–240
 - cryogenic air separation 269–291
 - physical absorption precombustion 241–268
- CO₂ scrubbing 92, 111–268
- CO₂ separation 295–495
- CO₂ storage
 - infrastructure networks 558f
 - life cycle assessment 90
 - see also* carbon transportation and storage (CCS)
- CO₂ stream composition 545
- CO₂ transportation and storage (CCS) 405, 541–582
 - see also* carbon transportation
- CO₂–amine chemistry 135ff
- CO₂–H₂ separation 113
- CO₂–H₂O chemistry, 134
- CO₂–H₂S cocapture 261
- CO₂–N₂ separation 358, 372
- CO₂–O₂ atmosphere 70
- CO₂-selective membranes 439, 445f
- CO₂-selective water gas shift membrane reactor (WGSMR-CO₂) 451
- coadsorption 242
- coal combustion 273
- coal consumption 527f
- coal direct chemical looping 481
- coal gasification 54, 58, 510
- coal mining 103
- coal seams carbon storage 575, 590
- coal-fired power plants 11, 27
 - carbonate looping 514
 - CO₂ capture 45–83, 113–154
 - CO₂ compression 75
 - life cycle assessment 90
 - oxyfuel process 276, 405–430
 - postcombustion 381–403
 - precombustion 241, 431–472
- cold-end optimization 20
- combined cycle chemical looping 508
- combined metal oxides 484
- combustion 11
 - carbon capture 65f
 - chemical looping 475–504
 - CO₂ separation 55, 59, 381–403
 - cryogenic air separation 276f
 - energy conversion 113
 - oxyfuel 405ff
 - oxygen transfer membrane 424
 - precombustion 445
 - solid fuels 478f
 - ZEITMOP 418
- commercial membranes 440
- commercial solvents 184
- CoMo-based WGS catalysts 262
- composite membranes 310
- compositions 545
- compression 74ff
 - absorption materials 156
 - carbonate looping 519
 - life cycle assessment 90, 94
 - membranes 433
 - oxyfuel process 408
 - postcombustion 384
 - precombustion 446
- concentration
 - chemical absorption 141
 - membranes separation 300

- oxyfuel process 278 ff
 - polarization 312 f
 - condensation 12
 - carbon capture 65
 - oxyfuel process 272
 - preheating 289
 - pressure 21
 - conductivity
 - absorption materials 185
 - membranes 30, 319 ff
 - MIEC 325
 - MPEC 330
 - configuration
 - oxyfuel process 274
 - see also* schematics
 - confinement layers 535
 - constant-pressure operation 29
 - construction, pipelines 551, 565
 - contaminants 547
 - see also* impurities
 - convection 11
 - conversion 12
 - cooling range 36
 - cooling water 21, 102
 - copper-based oxygen carriers 478 ff, 482, 510
 - coprecipitation 490
 - coretenation 437
 - corrosion
 - absorbents 143, 203, 210
 - absorption materials 183
 - CO₂ compression 533
 - degradation 210
 - inhibitors 214, 228
 - pipelines 545 ff
 - costs 556–565
 - cracks 340, 574
 - cradle-to-grave life cycle assessment 85
 - creep-resistant steel types 33
 - critical membrane thickness 327
 - critical point 47
 - critical pressure 545
 - critical temperatures 273
 - cryogenic air separation 54, 271
 - CO₂ removal 58 f, 269–291
 - oxyfuel process 70, 405
 - cryogenic methods
 - CO₂ capture 114
 - precombustion decarbonization 246
 - WGS_{MR}-H₂ postcombustion 461
 - crystal lattice 64, 319, 324
 - crystalline materials 303, 307
 - SEWGS 258
 - zeolites 319, 339
 - cuprous salts 210
 - cyclic sorption processes 250
- d**
- decarbonization
 - chemical looping 480
 - DEMPG precombustion 243
 - postcombustion 210
 - syngas 241 f
 - decomposition products 121
 - deep rock formation bacterias 104
 - defects 303, 308, 340
 - degradation
 - absorbents 210
 - alkanolamines 159
 - amines 103
 - CASTOR pilot plant 223–228
 - membranes 340
 - oxyfuel process 407
 - potassium/sodium carbonates 162
 - wash solution 216
 - demonstration plants 201, 215 f
 - denitrification (DeNO_x) 114, 213, 409
 - see also* oxyfuel
 - dense membranes
 - ceramic 307, 440
 - CO₂ selective 63, 319
 - H₂-selective 453
 - inorganic 389
 - polymer 364 f
 - precombustion 438
 - proton-conducting 431
 - density 193, 279, 408
 - deposition–precipitation 488
 - depth underground CO₂ storage 49
 - design 210, 299
 - desorption
 - absorbents postcombustion 207
 - absorption materials 156, 161
 - CO₂ capture 121, 139
 - pilot coal power plants 220
 - polymeric membranes 390
 - desulfurization
 - absorbents postcombustion 208, 213
 - membranes precombustion 433
 - oxyfuel process 275, 409
 - SEWGS 261
 - development 12 f, 321
 - diamines 206
 - diethanolamine (DEA)
 - absorbents postcombustion 203
 - absorption materials 157, 192

- CO₂ chemical absorption 135, 140
- CO₂ separation 57
- foaming tendencies 229
- diethylamine (DETA) 143, 192
- diethylethanolamine (DEEA) 158
- diffusion
 - ceramic membranes 338
 - CO₂ capture 124, 145
 - CO₂ separation 61, 64
 - membranes separation 297, 304ff
 - polymer membranes 360ff, 367, 390
 - precombustion decarbonization 247
- diffusivity
 - flue gas 408
 - membrane precombustion 441
 - membranes separation 300
 - polymer membranes 357
- diglycolamine (DGA) 157
- diisopropanolamine (DIPA) 143, 157, 184, 191
- diisopropylamine (DIPAM) 143, 192
- dilution 4
- dispersion 4, 549
- displacement 304
- dissipation temperatures 20
- dissolution 243, 585f
- distillation 246
- dolomite 516
- doped rare-earth oxides membranes 440
- doping 319
- driving force
- gas separation 391
 - H₂-selective membranes 453
 - membranes separation 313
 - postcombustion process 381
 - WGS_{MR}-H₂ 458
- dual-mode sorption membranes 360
- dust 27
 - flue gas scrubbing 215
 - life cycle assessment 92, 103
 - membranes precombustion 432
 - oxyfuel process 275
 - polymer membranes 353
- e**
- economics 399
- economizers (ECO) 518
- ecosystems 104
- efficiency
 - AZEP process 417
 - carbonate looping 518
 - chemical looping 505, 509
 - CO₂ capture 50, 117
 - CO₂ transport 563
 - coal power plants 46
 - cryogenic air separation 284f, 289f
 - cryogenic oxygen production 59
 - EFCC process 421
 - hard coal-fired power stations 32
 - membranes precombustion 432f, 442
 - oxyfuel process 71, 271, 405, 412
 - postcombustion process 381
 - power plants 12f
 - SEWGS 252
 - steam power plant 15f, 20
 - WGS_{MR}-H₂ 460
- effluents 4
- Einstein–Smoluchowski equation 330
- electrical power 11
- electrical swing adsorption (ESA) 246
- electronic conductivity 330
- electrostatic precipitator (ESP) 212f, 382
- emergency action plans 535
- emissions
 - carbon capture 4
 - flue gas 408
 - life cycle assessment 99
 - see also* greenhouse gases
- empty space mass transport 303
- end-of-pipe technology 53
- endothermic reactions 476, 507
- endothermic reactions 483
- energy consumption
 - absorbents postcombustion 201
 - absorption materials 183, 210
 - carbon capture 3
 - CO₂ capture 116, 123
 - CO₂ compression 528f, 539
 - degradation 210
 - gas separation 395
 - life cycle assessment 92
 - membrane gas separation 399
 - oxyfuel process 408
 - SEWGS 252
- energy demand
 - CCS 50
 - CO₂ compression 75
 - cryogenic oxygen production 59
 - life cycle assessment 88
- energy efficiency *see* efficiency
- energy losses *see* losses
- energy site distribution model 360
- energy transformation 12
- engineering CO₂ capture 113
- enhanced oil recovery (EOR) 533ff, 542, 584

- enhancement factor 132
 - entropy diagram 531
 - environmental impact 536, 545
 - CO₂ pipelines 565
 - flue gas scrubbing 215
 - life cycle assessment 100ff
 - oxygen carrier materials 483
 - enzyme-promoted processes 146
 - equilibrium constants 133, 136, 180
 - equilibrium kinetics 116, 279
 - Esbjerg Pilot Plant 219
 - ethylene glycol dimethyl ether (DME) 217
 - ethylene oxide-based polymer membranes 320, 356ff
 - ethylethanolamine (EEA) 158
 - eutrophication 103
 - evaporators 34ff, 518
 - excess carbon 4ff
 - excess oxygen 276, 280f
 - excess ratio 409
 - exergy losses 20
 - exhaust steam 20
 - exothermic reactions 156, 476
 - exothermic reactions 507
 - exploratory wells 535
 - extended flue gas heat utilization 25
 - externally fired combined cycle (EFCC) 420
- f**
- facilitated transport membranes
 - CO₂ capture 115
 - CO₂ separation 62
 - precombustions 440, 445
 - failures 439, 548
 - fans 27
 - Faraday constant 309
 - Fe–Cr catalysts 458
 - feed
 - gas separation 396
 - membranes separation 300
 - oxyfuel process 407
 - SEWGS 250
 - water 18
 - fiber membranes 319
 - Fick's laws
 - CO₂ chemical absorption 132
 - CO₂ physical absorption 127f
 - membranes separation 304
 - PEBAX/S-PEEK 367ff
 - polymer membranes 361ff
 - filtrations 222
 - Fischer–Tropsch synthesis 161
 - flammability 193
 - flashing 181, 243
 - flexibility 557
 - Flory–Huggins model 360, 366, 376
 - flow distribution 311
 - flue gas
 - absorption materials 155
 - CASTOR pilot plant 221
 - chemical looping 475
 - CO₂ separation 54
 - extraction 36
 - heat utilization 24
 - impurities 113
 - losses 24
 - oxyfuel process 271, 405–409
 - pilot coal power plants 215
 - purification 382
 - scrubbing 92, 213
 - steam power plant 33
 - flue gas desulfurization (FGD)
 - absorbents postcombustion 212f
 - carbonate looping 516
 - outlet 383
 - oxyfuel process 285
 - postcombustion 383
 - flue gas recycling
 - carbon capture 65
 - cryogenic air separation 273f
 - oxyfuel process 71
 - polymer membranes 351ff
 - fluid dynamics 299, 311f
 - fluidization agents 510
 - fluidized bed
 - chemical looping 476, 479ff
 - drying 28
 - see also* WTA process
 - Fluor Solvent
 - absorption materials 184, 190f
 - CO₂ capture 130
 - precombustion decarbonization 243
 - fluorite membrane 64, 418
 - fly ash 24, 353
 - foaming 224ff, 245
 - food-grade CO₂ transport 553
 - forced draft (FD) fans 27
 - formal procedures 567
 - formic acid 228
 - fossil carbon storage 573–600
 - fossil fuels
 - carbon capture 3
 - chemical looping 505
 - coal power plants 45
 - membranes CO₂ separation 319

- oxyfuel process 271
- fouling 39, 438
- four-end design oxyfuel process 406, 411 f
- four-end H₂-selective membranes
 - modules 453
- fracture mechanics 535
- fragmentation 481
- free water formation 547
- freeze granulation 485
- freezing point 185
- fuel
 - brown coal drying 27
 - chemical looping 505
 - membranes precombustion 433
 - oxyfuel process 279
 - WGS_{MR}-H₂ 458
 - see also* fossil fuel, gaseous fuel etc.
- Fuel-Flexible process 481
- furnace outlet temperature 39

g

- gas combustion 46
- gas composition 179
- gas fields carbon storage 575
- gas friction 303
- gas heating reforming (GHR) 437, 461 f
- gas permeation *see* permeation
- gas processing unit (GPU) 285
- gas purification 382
- gas separation
 - carbon capture 65
 - chemical looping 475
 - CO₂ capture 55, 113 f
 - coal power plants 54 f
 - membranes 297, 319, 386
 - postcombustion 381
- gas transport 351, 360 f
- gas turbine 508
- gas volume flow impact 225
- gaseous fuels 507
- gas-fired power plants 86, 97, 106
- gasification
 - absorption materials 175
 - agents 432
 - chemical looping 510
 - CLOU 478
 - membranes precombustion 432
 - precombustion decarbonization 245
 - solid fuels 480 f
- gas-liquid interface 124, 156
- gas-phase conditions 305
- generator losses 26
- geological formations pressing 48, 215

- geological mapping 535
- geological sequestration 592
- geological storage 573, 586
- geological time scales 585
- Gibbs' free energy 117
- Gibbs' phase rule 166
- glass transition temperature 305, 355, 369
- glassy aromatic poly(ether ether ketone) 351 f
- glassy membranes 61
 - H₂-selective 439
 - polymeric 354, 388
- glycine 142, 205
- glycolic acid 228
- Goldschmidt tolerance factor 322
- granulation 485
- graphical representation
 - chemical absorption 131
 - membrane modules 311
 - membranes concentrations 312
 - physical absorption 126
 - see also* schematics
- greenhouse gas 104 ff
 - chemical looping 475, 505
 - coal power plants 45, 215
 - life cycle assessment 84, 91 ff
 - see also* CO₂
- ground water impacts 536
- gypsum 515

h

- H₂-CO₂ 113
- H₂-CO₂, metal membranes selectivity 64
- H₂-CO₂, precombustion decarbonization 245
- H₂S tolerance 442
- H₂-selective membranes 438, 453 f, 458
- hard coal-fired power plants 11, 32
 - life cycle assessment 86, 91, 97
 - greenhouse gas emissions 106
 - oxyfuel process 280 f, 408 f
- health impact 103
- heat capacity 15, 408
- heat degradation 210
- heat dissipation 20
- heat exchangers 410
- heat extraction 15, 36
- heat flow diagram 19
- heat integrated reforming (HIR) 437, 461 f
- heat integration 525–540
- heat rate changes 29
- heat recovery 518, 532 f
- heat transfer 274

- heat-stable salts 159, 222
 - Henry's law 57
 - absorption materials 179
 - chemical absorption 133, 138
 - membranes 304
 - physical absorption 128f
 - polymer membranes 360, 363
 - precombustion decarbonization 243
 - solvents 195
 - high-pressure gasification 75
 - high-pressure steam generator 15
 - high-temperature calciner 60
 - high-temperature CO₂ compression 532
 - high-temperature shift 442
 - hindered amines 57
 - Hoff equation 139
 - hollow fiber membranes 309, 328
 - hopper ash 24
 - hopping distance 330
 - hot flue gas transfers 11
 - hybrid absorbents 142
 - hybrid combustion–gasification 481
 - hybrid membranes 389
 - hybrid physical–chemical absorption 245
 - hybrid physical–chemical solvents 243
 - hydrate formation 546, 589
 - hydration 57
 - hydrocarbons 183, 506, 534
 - hydrochloric acid 228
 - hydrodynamics 48, 299
 - hydrogen
 - CO₂ combustion 53f
 - CO₂ removal 246
 - CO₂ transport 546
 - cooling 26
 - copermeation 446
 - formation 434
 - membranes separation 297, 319ff
 - MPEC 329
 - NGCC membranes 461
 - precombustion decarbonization 243
 - hydrogencarbonates
 - absorbents postcombustion 205
 - absorption materials 158
 - fossil carbon storage 585
 - mineral sequestration 575
 - hydrogencyanide 201
 - hydrophilic polymers 351f, 368
 - hydrotalcite-based materials 241, 253–263
 - hydrothermal synthesis 489
 - hyperbranched polymers 146
 - HyPr-ring process 481
- i*
- Iceland lava flows 586
 - ideal gases equation 116
 - Ifpexol 130, 184
 - ilmenite 511, 484
 - imidazolidinones 159
 - imidazolium-based RTILs 194
 - impact categories 89–95
 - implementation 557
 - impregnation 485
 - impurities 48
 - absorbents postcombustion 208
 - argon 58
 - CO₂ transport 545ff, 550ff
 - oxyfuel process 279
 - polymer membranes 353
 - In Salah gas field 579
 - induced draft (ID) fans 27
 - injection well configuration 536, 574
 - inorganic chemical absorbents 206
 - inorganic membranes
 - CO₂ separation 63, 319
 - decarbonization 247
 - gas separation 389
 - precombustion 439f
 - input/output balance 85
 - integrated gasification combined cycle (IGCC) 46
 - absorption materials 175, 195
 - carbon capture 53, 65
 - chemical looping 505
 - CO₂ capture 116
 - life cycle assessment 84f, 93
 - lignite-fired 95
 - membranes precombustion 431ff
 - precombustion 72
 - scrubbing 444
 - SEWGS 241, 251
 - WGS_{MR}-H₂ 458
 - intercooling 123
 - intermediate CO₂ storage 554
 - intermediate pressure (IP) turbine 17
 - intermediates 135
 - internal turbine 23
 - internal waste heat exploitation 27
 - see also* WTA process
 - inventory analysis 85
 - investment decisions 561f
 - ion transport membranes (ITM) 321, 422
 - ionic conductivity 30, 319
 - MIEC 325
 - MPEC 330
 - ionic liquids

- acid–base reactions 156
- chemical absorption 168f
- CO₂ capture 146
- physical absorption 175f, 192
- iron-based oxygen carriers 510, 478–482
- ISO Standards 14.040/14.044 86
- isothermal separation 50

k

- kinetics
 - CO₂–amine reaction 203
 - fossil carbon storage 585
 - hydrate formation 547
 - microporous membranes 338
 - oxygen carrier materials 495
 - polymer membranes 361, 367
- Knudsen diffusion
 - ceramic membranes 338
 - membranes separation 303, 321
 - precombustion decarbonization 247
 - SOD zeolite membrane 342
- Kröger-Vink notation 331

l

- La_{5,8}WO_{11,7} membranes 335
- LaBarge Field 578
- laminar boundary layer 313
- Langmuir-type sorption isotherm 306
- lattice defects 303
- layered MIEC membrane 326
- leakage 88, 102, 550
 - see also* losses
- liability 596
- life cycle assessment (LCA) 83–110
- lignite firing
 - greenhouse gas emissions 106
 - life cycle assessment 86–97
 - oxyfuel process 282
- limestone
 - carbonate looping 515
 - carbonation/calcinations 115
 - chemical looping 506
 - CO₂ separation 60
 - fossil carbon storage 585
- Linde type A (LTA) zeolite membranes 341
- linear sorption isotherm 301
- liquefaction
 - CO₂ capture 115
 - CO₂ separation 68
 - CO₂ transport 554
- liquid absorbents 113f
- liquid alkaline solutions 242
 - see also* alkanolamines

- liquid phases 156, 242
- liquid/gas ratio 213
- liquids absorption 55
- liquid–vapor equilibrium 243
- live steam conditions 13ff, 39
- loading
 - absorption materials 156, 180
 - ammonia absorption 163
 - CO₂ transport 554
 - postcombustion 212
- long-distance CO₂ pipelines 543
- long-term liability 537f
- losses
 - age dependent 31
 - chemical looping 505
 - coal power plants 46
 - membranes precombustion 432, 442
 - oxyfuel process 288, 405, 415
 - polymer membranes 359
 - power plant 11
 - steam power plant 15, 23f, 26f
 - WGS_{MR}-H₂ 460
- lower heating value (LHV) 50
- low-pressure turbine 20
- low-temperature distillation 246
- low-temperature water gas shift 442
- LSCF perovskite 426

m

- macroporous membrane materials 303
- macroscopic mass transport 300
- magnesium carbonate 257
- magnetism 322
- main air compressor (MAC) 288
- maintenance costs 551
- malonic acid 228
- manganese-based oxygen carriers 482, 510
- marine transport system 556
- mass transport
 - absorption materials 164
 - ceramic membranes 338
 - chemical absorption 132
 - dense membranes 390
 - gas separation 391
 - membranes separation 299–313
 - MPEC 332
 - oxyfuel process 277
 - physical absorption 125
 - polymer membranes 351
 - SEWGS 256
- master cycle 17
- materials 17, 33ff
 - chemical looping 475–504

- CO₂ pipelines 545, 548 f
- CO₂ separation 299, 317–378
- gas separation 55, 387
- membranes precombustion 439
- MPEC 329
- oxyfuel process 406
- oxygen carrier 321, 475–504
- SEWGS 256 f
- mechanical properties
 - membranes 321, 387
 - MIEC 324, 421
 - polymer membranes 352, 439
- mediator recirculation integrating technology (MERIT) 477
- melting points 192 ff, 483
- membrane integration
 - IGCC/NGCC power plants 433
 - oxyfuel process 405
 - precombustion 431
- membrane materials
 - gas separation 387
 - oxyfuel process 406
 - polymeric 354
 - precombustion 439
 - see also* materials
- membranes
 - carbon capture 65
 - CO₂ capture 72, 114
 - CO₂ separation 52 ff, 295–316
 - coal power plants 45
 - gas separation 60 ff, 321 f, 390 f
 - geometries 309
 - modules 299 ff
 - morphologies 310
 - organic 351–378, 387
 - oxyfuel process 405–431
 - postcombustion 381, 385 ff
 - precombustion decarbonization 247
 - precombustion 431–472
 - process design 359
 - resistances 313
 - selective permeation 241
 - see also* metallic membranes
- metal chelating agents 144
- metal oxides
 - chemical looping 59, 506, 510
 - oxygen transfer 476
- metallic membranes 64
 - decarbonization 247
 - H₂-selective 453
 - precombustion 438 ff
 - WGSMR-H₂ 459
- meteorological conditions 548
- methane
 - chemical looping 479
 - CO₂ transport 546
 - life cycle assessment 103
 - lower heating values 50
 - precombustion 437
- methane–steam membrane reformer (MSMR) 437 f, 464
- methanol
 - absorption materials 184 ff
 - CO₂ capture 130
 - precombustion 243, 445
- methyl cyanoacetate 130
- methyl isopropyl ethers (MPE) 190
- methyldiethanolamine (MDEA)
 - absorbents postcombustion 204
 - absorption materials 157, 177
 - CO₂ separation 57
 - foaming tendencies 229
 - membranes precombustion 433
 - SEWGS 251
- microporous membranes
 - CO₂ separation 63, 319
 - hydrogen separation 338
 - materials 303
- Milano cycle 419
- mineral sequestration 5, 575, 585, 592
- mineralization 48, 573, 586
- minimum energy requirement 50, 117
- mining activities 536
- mixed amines *see* amines
- mixed gas permeation 355
- mixed ionic electronic conductors (MIECs) 64, 406, 409 f
 - oxyfuel process 420
 - CO₂ separation 319 ff
- mixed physical–chemical solvents 184, 191
- mixed proton–electron conducting (MPEC) membranes 329 ff
- mixed-matrix membranes (MMMs) 62, 389
- mobility 300, 330, 355
- modules
 - membrane gas separation 311, 386
 - MIEC membrane 328
 - oxyfuel process 421 f
 - molar flue gas compositions 383
- molecular diffusion 338, 390
- molecular oxygen release 513
- molecular sieves 246
- molecular structures 357
- molecular tailoring 299
- molecular transport 351

- molecular weights 185
 - monitoring fossil carbon storage 595
 - monoethanolamine (MEA)
 - absorbents postcombustion 201
 - absorption materials 157
 - AZEP process 417
 - CASTOR pilot plant 221
 - chemical looping 477
 - CO₂ chemical absorption 135, 140ff
 - CO₂ separation 57, 67, 90
 - foaming tendencies 229
 - life cycle assessment 86, 90ff, 102
 - membranes precombustion 433
 - morphologies 309
 - MTR Polaris membrane 359
 - multiple casing injection well 535
 - multi-stage compressor 529
- n**
- nanofiltration membranes 340
 - natural carbon cycles 593
 - natural draft cooling towers 21
 - natural gas combined cycle (NGCC) 46
 - absorbents postcombustion 201
 - hydrogen-selective membranes 461
 - membranes precombustion 431, 444
 - membranes separation 297
 - SEWGS 251f
 - Nd₆WO₁₂ bulk membrane 336
 - nickel-based oxygen carriers 479, 482, 495
 - nickel-based superalloys 35
 - niobates 319
 - nitrogen
 - chemical looping 475
 - CO₂ capture 113
 - CO₂ transport 546
 - impurities 48
 - membranes separation 298ff
 - oxyfuel process 279
 - nitrosamines 1443
 - nitrous oxides 155
 - N-methyl-2-pyrrolidone (NMP) 185, 243
 - N-methyldiethanolamine *see* methyldiethanolamine (MDEA)
 - nomenclature 147f
- o**
- ocean disposal storage 574f
 - offshore mooring storage 556
 - offshore pipelines 552
 - offshore wind power 105
 - oil fields storage 575
 - olivine 576, 594
 - onshore pipelines 552
 - operating conditions
 - CASTOR pilot plant 222
 - chemical looping combustors 493f
 - membranes 321, 440
 - metallic membranes 439
 - mixed ionic electronic conductors 406f
 - oxyfuel process 410
 - steam power plant 31
 - turbines 29
 - operating temperature
 - absorption materials 185
 - CO₂ capture 73, 117
 - inorganic membranes 63
 - oxyfuel process 406, 410
 - WGS reaction 178
 - Optisol 245
 - organic carbon forms 590
 - organic material storage 583
 - organic membranes 351–378, 387
 - organic Rankine cycle (ORC) 71
 - organic solvents 184
 - overall minimum energy 117
 - oxalic acid 228
 - oxazolidinones 159
 - oxidation degradation 210
 - oxycoal 405, 425
 - oxyfuel process 53
 - carbon capture 65f
 - carbonate looping 516
 - chemical looping 505
 - CO₂ capture 114, 546
 - CO₂ separation 55
 - coal power plants 45
 - cryogenic air separation 70, 271f
 - life cycle assessment 100
 - lignite-fired power plants 95
 - O₂-transport membranes 405–430
 - plant design 285
 - oxygen
 - chemical looping 511
 - CO₂ capture 70, 113
 - CO₂ compression 534
 - CO₂ transport 546
 - flue gas scrubbing 213
 - membranes separation 298–307
 - MIEC membrane 325
 - MPEC 331
 - oxyfuel process 271–281, 405–431
 - oxygen carrier materials 475–506
 - oxygen storage materials (OSMs) 320
 - oxygen transfer membrane (OTM) 319ff, 405–430, 460

- oxygen uncoupling chemical looping, (CLOU) 478–504
- oxygen-blown gasifiers 432
- p**
- packed columns contactors 124, 310
- palladium-based membranes 64, 438ff
- para* substitution 357
- partial pressure
 - absorption materials 165
 - carbonate looping 514, 519
 - CO₂ capture 114
 - gas separation 57, 391
 - H₂-selective membranes 453
 - membrane precombustion 441
 - membranes separation 304, 323
 - methanol solubility 187
 - MPEC 329
 - oxyfuel process 407, 410
 - physical absorption 127
 - polymer membranes 363
 - precombustion decarbonization 243
- partitioning 297
- part-load operation losses 29
- payback time 563
- PEBAX polymer membranes 365–376, 447
- pelletized sorbent material 253
- penetrant–polymer interactions 368
- perfluorinated compounds (PFCs) 190
- permeability
 - CO₂ separation 61 ff, 73
 - membranes separation 310, 386
 - oxygen transfer membrane 424
 - polymer membranes 353, 357
 - ZEITMOP 418
- permeation 303
 - CO₂ separation 69
 - gas separation 393
 - membranes precombustion 432f, 437, 441
 - membranes separation 297, 300
 - oxyfuel process 406
 - polymer membranes 354f, 363, 370
- perovskite membranes 307ff, 332
 - BO_{6/2} octahedra 323
 - CO₂ separation 64
 - oxyfuel process 407, 425
 - oxygen carrier materials 484
 - ZEITMOP 418
- phase change absorbents 146
- phase diagrams 48, 533, 588ff
- phase separation behavior 357
- phenyl rings *para* substitution 357
- phosphonium 194
- photovoltaics 105
- physical absorption 54ff, 113–154
 - materials 175–198
 - membranes precombustion 432
 - precombustion 72, 241–268
- physical properties 47, 145f
 - gas transport 303
 - membranes 297–322
 - solvents 185, 193
- physical scrubbing 444
- physical solvents 184
- physical–chemical interaction 390
- physical–chemical scrubbers 58
- physicochemical properties 364
- piezoelectricity 322
- pilot plants 201, 215–230, 425
- pipelines 47, 74, 532–567
- pipelines 88
 - postcombustion 383
 - precombustion 433, 446
- piperazine
 - absorbents postcombustion 204
 - chemical absorption 135, 140ff
 - degradation products 159
- pipework losses 26
- plant concepts 65f
- plasticization 351, 355, 370, 388, 439
- plate columns contactors 124
- point defects 330
- polar groups 356
- Polaris membrane (MTR) 359
- polarity 386
- policy decisions 6
- pollution 215, 271, 280
- polyacetylenes 357
- polyamides 365, 388
- polyamidoamine (PAMAM) 62
- polyaniline 357
- polyarylates 357
- poly(arylene ether)s 357
- polybenzimidazole (PBI) 439f, 454
- polycarbonates 357, 388
- polydimethylsiloxane (PDMS) 388
- poly(ether ether ketone) (S-PEEK) 351f
- poly(ether imide)s 357
- poly(ethylene glycol) (DMPEG) 58, 185, 188
- poly(ethylene oxide) (PEO) 62, 351–359, 389
- polyimides 62, 357, 388
- poly(phenylene oxide)s (PPO) 357, 388
- polymer materials transport 304

- polymeric membranes
 - CO₂ capture 115, 354f
 - CO₂ separation 61, 69, 73
 - flue gas treatment 364f
 - H₂-selective 455
 - precombustion 439–445
 - separation 297, 310, 388
- polymerization degradation 210
- polypyrrolones 357
- polysulfones (PSF) 357, 388
- polyvinylamine (PVA) 62
- pore trapping 586
- porous membranes 303, 340
 - gas separation 389, 431, 439f
 - oxygen carrier materials 482
- postcombustion
 - absorbents CO₂ removal 201–242
 - absorption materials 155
 - carbon capture 65 ff
 - carbonate looping 514
 - chemical looping 505
 - CO₂ capture 53 ff, 69, 113
 - CO₂ compression 75
 - CO₂ separation 55, 59, 381–403
 - CO₂ transport 546
 - life cycle assessment 84 ff
 - lignite-fired power plants 95
 - membranes separation 62, 298
 - oxyfuel process 405
 - polymer membranes 351 f
- potassium carbonate (potash) 206, 219
 - absorption materials 160 f
 - chemical absorption 140
 - formation/decomposition 260
 - mineral sequestration 575
 - pilot coal power plants 217
- potassium salts 205
- power requirement *see* energy consumption
- power stations 113
- precombustion 53
 - absorption materials 176 f
 - carbon capture 65 f, 431–472
 - CO₂ capture 72, 113
 - CO₂ compression 75
 - CO₂ separation 55, 62, 320
 - CO₂ transport 546
 - CO₂-selective membranes 445 f
 - H₂-selective membranes 453 f
 - life cycle assessment 86
 - lignite-fired power plants 95
 - oxyfuel process 405
 - physical absorption 241–268
 - polymer membranes 352
 - scrubbing 444 f
 - silica membranes 341
- preheating 289
- pressure 47
 - absorption materials 161
 - carbonate looping 514
 - chemical looping 479
 - CO₂ compression 528
 - CO₂ separation 69
 - CO₂ transport 545
 - gas separation 394
 - H₂-selective membranes 453
 - membranes separation 314
 - oxyfuel process 287
 - pipeline transport 534
 - polymer membranes 357
 - precombustion 444
 - SEWGS 250
 - swing adsorption 246
- pressurized air feed 411
- primary amines *see* amines
- principle *see* schematics
- process conditions
 - CO₂ capture 120f
 - membrane CO₂ separation 299, 313 f, 382 f
 - membranes precombustion 432 f
 - polymer membranes 359
 - postcombustion 359, 382
- process flow diagram
 - chemical absorption 122, 131 f
 - CO₂ capture 315
 - perovskite CAR unit 426
 - physical absorption 124
 - precombustion 120
 - see also* schematics
- processes
 - absorption materials 179 f
 - CCS 46
 - CO₂ scrubbing 199–268
 - membrane CO₂ separation 379–472
 - methane reforming 461
 - oxyfuel process 405
- propylene carbonate 130, 184f, 190f, 244
- proton defects 331 f
- protonation 57, 159
- proton–electron conductor 319, 329
- prussic acid 201
- Pt/ZrO₂ catalysts 458
- public policy 537 f
- pumps 27
- purge step 252
- purification

- CO₂ separation 61
- CO₂ transport 546
- oxyfuel process 71, 278, 283
- postcombustion 382
- Parisol
 - absorption materials 184, 189f
 - CO₂ capture 130
 - precombustion decarbonization 243
- purity
 - CO₂ capture 114ff
 - CO₂ compression 539
 - CO₂ 47, 57, 533f
 - CO₂-selective membrane 448ff
 - membrane precombustion 441
 - oxyfuel process 271, 409
 - postcombustion 385
 - precombustion 243
 - syngas 182
- pyridinium 194
- pyrochlores 319

q

- quantitative risk assessment (QRA) 549

r

- radiation 11, 408
- Ramgen compressor 530
- Rankine process 421
- rate absorption constants 133
- raw gas shift 442
- reaction kinetics 133, 279, 585
- reaction–sorption step 250
- reactivity 481f, 495f
- reactor design 493f
- reboiling 221, 243, 533
- recirculation
 - chemical looping 475
 - membranes precombustion 432
 - oxyfuel process 275, 279, 405–411
- reclaimers 227
- recompression 51
- rectification 54, 58, 272, 284
- Rectisol
 - absorption materials 184ff
 - CO₂ capture 130
 - CO₂ separation 58
 - precombustion decarbonization 243
- recycle ratios 67, 274
- reducing agents 485
- reforming 431–471, 479f
- regeneration
 - CO₂ recovery cycle 532
 - CO₂ removal 241

- liquid absorbents 118
- membranes 441
- regulations 561f
- reheaters 17, 518
- relaxation 327, 351–361
- release failure 549
- renewable energies 84, 104f
- residual oxygen 281
- resistances 313
- respiratory diseases 103
- retentate
 - CO₂ capture 116
 - membranes separation 302, 314
 - polymer membranes 360
 - recycling 397
 - two-stage membrane processes 397
- rinse step 250
- risk mitigation 550
- Robeson plot 61, 358
- rock formations 535
- room-temperature ionic liquids (RTILs) 193
- Rose Run formation 587
- rubbery membranes 62, 351ff, 388
- rupture 548

s

- safety
 - CO₂ compression 535
 - CO₂ pipeline transport 545ff, 568
 - fossil carbon storage 594f
- saline aquifers 49, 104
- salt formation 165, 535, 575
- saturation 156
- scanning electron micrograph (SEM)
 - BSCF5582 membrane 327
 - hollow-fiber membrane 353
 - SEWGS 260
 - skinned/composite membrane 310
- schematics
 - absorption–desorption process 202
 - amine scrubbing process 68
 - AZEP process 417
 - Boundary Dam power station 231
 - CAR unit 426
 - carbonate looping 59, 514, 520
 - cascaded membranes 397, 449
 - CASTOR pilot plant 220, 230
 - chemical absorption 122
 - chemical looping 59, 477, 506
 - chilled-ammonia process 208
 - CLC test plant 512
 - CO₂ chemical absorption 131

- CO₂ physical absorption 126
- CO₂ postcombustion (MTR) 359
- CO₂ separation 56
- CO₂-selective membrane 315, 446
- CO₂-selective WGS membrane reactor 451
- conventional reference power plant 284
- driving force generation 391
- externally fired combined cycle 420
- flue gas purification system 383
- gaseous fuels CLC 507
- H₂-selective membrane 454
- IGCC process without CO₂ capture 176, 433 ff
- injection wells 536 ff
- ITM process 422
- membrane gas separation 312, 352, 386
- membrane modules 311
- methane reforming 248, 464
- MIEC membranes 322, 326 ff, 410 f
- Milano cycle 419
- non-integrated oxyfuel power plant 286
- OXYCOAL-AC pilot module 425
- oxyfuel process 71, 272, 275, 517
- oxygen transfer membrane 424, 460
- postcombustion CO₂ capture 382
- precombustion CO₂ capture 72, 120
- Purisol 190
- Rectisol 186
- Selexol 189, 244
- SEWGS 251
- University of Regina test plant 231
- water gas shift 443, 458
- WTA-process 28
- ZEITMOP 418
- scrubbing
 - absorber materials 195
 - CO₂ removal 243
 - CO₂ separation 58, 67
 - CO₂ 111–268
 - IGCC 178 f
 - postcombustion 382
 - precombustion 444 f
- SCY membranes 334
- seawater 38, 102
- secondary amines 203
 - see also* amines
- sedimentary rock storage 575
- selective catalytic reduction (SCR) 382
- selectivity
 - absorption materials 185
 - CO₂ separation 54, 61
 - CO₂-selective membrane 448 ff
 - H₂-selective membranes 73456
 - inorganic membranes 64
 - liquid solvents 243
 - membranes 301, 310 ff, 386, 393
 - metal membranes 64
 - oxyfuel process 406
 - polymer membranes 352 f, 356 f, 372
 - postcombustion 382
 - precombustion 73, 437, 445
 - WGS membrane reactor 453
- Selefining process 143
- Selexol 58, 130
 - absorption materials 184, 188 f
 - life cycle assessment 86
 - methane reforming 463
 - precombustion 243, 444
 - SEWGS 252
- sensitivity analyses 89
- separation 55
 - carbon capture 65
 - chemical looping 475
 - membranes 295–316
 - oxyfuel process 407
 - precombustion 439
- Sepasolv MPE 130, 184
- sequestration 575, 586
- serpentine 576, 594
- shift rate 439
- shifted coal gas separation 54, 59
- ships CO₂ transport 543 f, 552 f, 557 f
- shutdown losses 30
- silica-based membranes 340, 389, 440
- single-anchor leg mooring (SALM) 555
- single-stage compression 529
- single-stage membrane process 392
- single-stage precombustion 445
- skinned membranes 310
- slag heaps 103
- Sleipner Project 578, 587
- slip 441, 446
- social aspects 103
- sodalite (SOD) membranes 341
- sodium carbonates 160 f, 575
- sodium chloride 228
- sodium sulfite 228
- sodium thiocyanate 228
- sodium thiosulfate 228
- soil carbon reservoirs 5 577
- solar thermal power plants 105
- sol–gel membranes 63, 319, 339
- solid adsorbents 114
- solid carbonates 584
- solid fuels 478 f, 510

- solid membranes materials 303
- solid oxide fuel cell (SOFC) 321
- solid physical adsorption 246
- solid sorbents 241
- solid-bed gasifiers 432
- solids inventory 495 f
- solubility
 - absorption materials 185 f
 - CO₂ capture 121 ff
 - CO₂ separation 61, 64
 - membranes separation 304
 - physical absorption 126, 129
 - polymer membranes 358 ff, 390
 - potash 207
 - solvents 195
- solution combustion 485
- solution-diffusion model (SDM) 300, 363
- solvents
 - absorption materials 157
 - CO₂ separation 56 ff
 - commercially available 184
 - physical absorption 129
 - pilot power plants 217, 221
 - precombustion 444
 - regeneration 180, 381
- sorbent materials 241
- sorption isotherms
 - membranes 301, 305
 - polymer membranes 360, 366, 390
- sorption-enhanced steam methane reforming 248
- sorption-enhanced water gas shift (SEWGS) 241, 248 ff, 256 f
- sour gas 201
- sour water gas shift 436, 442
- specific gravity 185
- specific heat 185
- specific volume 354
- speed 557
- S-PEEK polymer membranes 365–376
- spin flash drying 486
- splitting 123, 479
- spray attemperator 17
- spray column contactors 124
- SrCeO₃ membranes 334
- stability 143
- staged CO₂-selective membrane 449
- staged water gas shift 442
- stagnant boundary layers 312
- stainless steel 548
- standards 211
- startup losses 30
- steady-state transients 261
- steam conditions 11, 16, 33
- steam generator 23, 29
- steam power cycle 532
- steam power plants 46, 53
 - carbon capture 53, 65
 - efficiency 15 f
 - life cycle assessment 86, 93
- steam pressures 35
- steam reforming 247, 480
- steam-iron process 481
- steam-methane reforming (SMR) 437, 461 f
- steam-water cycle 23
- steel types – 13CrMo44/
X20CrMoV121 33
- steel types – HCM2 S/7CrMMoVTiB 35
- sterically hindered amines 205
see also amines
- storage
 - carbon 3–10
 - CO₂ 525–600
 - fossil carbon 573–600
 - life cycle assessment 102
 - membrane precombustion 441
see also carbon capture and storage (CCS)
- strategic pipelines planning 565
- stratifications 214
- strengths 535
- stripping
 - CASTOR pilot plant 221
 - decarbonization 243
 - precombustion 444
 - SEWGS 250
 - solvent regeneration 181
- structural formula
 - piperazine 206
 - 2-amino-2-methyl-1-propanol 205
 - diethanolamine 204
 - glycine potassium salt 205
 - methyldiethanolamine 204
 - monoethanolamine 203
 - PEBAX/S-PEEK 365
 - perovskites 323
 - solvents 194
 - triethanolamine 204
- submerged turret loading system (STL) 555
- substitute natural gas (SNG) 243
- subterranean ecosystems 104
- suction 391 f, 396
- Sulfinol process 143, 184, 191
- Sulfolane 184
- sulfonated glassy aromatic poly(ether ether ketone) 351 f

- sulfonation 365
 - sulfur
 - CASTOR pilot plant 222
 - CO₂ compression 534
 - life cycle assessment 103
 - sulfur dioxide 155
 - sulfur oxides 275–283, 593
 - sulfuric acid 228, 409
 - superconductivity 322
 - supercritical fluid 48
 - supercritical phase 545
 - supercritical pressure 528
 - superheaters 17, 32f, 36
 - supersonic compression 529
 - support layer 352
 - surface diffusion 338
 - surface layer 300
 - sweet water gas shift 436, 442
 - swelling 362, 367
 - symbols/abbreviations 147, 236ff
 - syngas
 - absorption materials 177
 - chemical looping
 - decarbonization 241
 - membranes precombustion 432, 446
 - SEWGS 254
 - syngas chemical looping (SCL) 479ff, 510
 - synthetic fuels 582
- t**
- tail-end CO₂ capture 201f
 - tanks 554
 - tectosilicate membranes 341
 - temperature swing adsorption (TSA) 246
 - temperatures
 - absorbents postcombustion 202
 - absorption materials 161
 - carbonate looping 514, 519
 - CASTOR pilot plant 226
 - CO₂ compression 529
 - CO₂ transport 545
 - inorganic membranes 63
 - membranes precombustion 431
 - metallic membranes 439
 - oxyfuel process 273, 288, 406, 410
 - physical absorption 126
 - polymer membranes 354, 357
 - precombustion 246, 444
 - steam power plant 15, 20
 - water gas shift 442
 - terminal temperature difference (TTD) 22
 - ternary water vapor–gas transport 370
 - terrain pipeline conditions 551
 - tertiary amines 204
 - see also* amines
 - testing chemical looping combustors 493
 - tetrahydrofuran (THF) 217
 - theoretical gas/vapor transport 360f
 - thermal conductivity 185
 - thermal degradation 157
 - thermal efficiency 11, 15, 30
 - thermal heat input 413
 - thermal resistance 382, 387
 - thermal solvent regeneration 181
 - thermal stability 421
 - thermodynamics 24, 584
 - CO₂ phases 546
 - metal oxides 478
 - oxygen carrier materials 495, 508
 - thermo-economics 427
 - thermogravimetric analysis 259
 - thickness
 - membranes 386
 - MIEC membranes 327
 - perovskite membranes 309
 - polymer membranes 356, 361
 - three-end module 445
 - three-end oxyfuel process 406, 409f
 - titanium membranes 340
 - tower mooring system (TMS) 555
 - toxicity 208, 548
 - transformer losses 26
 - transients 261
 - transition metal elements membranes 322
 - transport mechanism
 - CO₂ separation 61, 63
 - membrane 319, 441
 - oxyfuel process 287
 - polymer membranes 357, 361f
 - precombustion 438, 441
 - see also* mass transport
 - transport number 331
 - transportation 47, 525–600
 - ife cycle assessment 86, 94, 102
 - see also* carbon capture and storage (CCS)
 - trapping mechanisms 586f
 - treated recycle 275
 - triethanolamine 204
 - tubular membranes 309, 329
 - tungstates 319
 - turbines 11, 17
 - CO₂-selective membrane 448ff
 - H₂-selective membranes 457
 - losses 29
 - turbulent bed absorber 213
 - two-phase flow 545

- two-stage compression 529
two-stage membrane processes 397
- u**
- underground gas storage (UGS) 566
underground injection storage 574, 594
unit size 12f
University of Regina test plant 230f
unloading concepts 555
untreated recycle 274
upstream conditions 382
utilization degree 97
- v**
- vacancies 64, 325
van der Waals volume 354
vapor compression 123
vapor–liquid equilibria 157, 162
vapor mass fraction 548
vapor pressure 185, 193, 360
vapor transport 351, 360f
Venturi scrubbers 432
vibrational frequency 330
viscosity 145, 185, 193
viscous flow 338
volatility 208
- w**
- wafer stack membranes 423
Wagner equation 64
– membranes separation 307
– MIEC membrane 325
– $\text{Nd}_6\text{WO}_{12}$ bulk membrane 336
– oxyfuel process 407
wall–gas interactions 303
wash solution
– absorbents postcombustion 203
– CASTOR pilot plant 222
– pilot coal power plants 215
– scrubbing 211
– University of Regina Test Plant 230
waste processing 11
– carbon capture 4
– life cycle assessment 103
– oxyfuel process 288
water
– CO_2 compression 534
– consumption 102
– dissociation 134
– impact 546
– membranes separation 298
– oxyfuel process 279
– permeability/selectivity 373
– splitting 479f
– vapor transport 353–376
water gas shift (WGS)
– absorption materials 177, 195
– CO_2 removal 241
– membrane reactor (WGSMR) 435
– membranes CO_2 separation 320
– membranes precombustion 432f, 442
– membranes separation 298
– precombustion 73, 247, 446
water–argon regeneration 261
water–steam cycle 410
weathering processes 576, 585
wells 535f
West Texas oil fields 578
wet cooling towers 22
Weyburn Project 579
Wilkie–Chang correlation 145
wind power 106
working principle
– MPEC 329
– oxygen transport membranes 321
see also schematics
WTA-process (Wirbelschichttrocknung mit Abwärmenutzung) 28
- x**
- XRD analysis 258
- y**
- Y-doped SrZrO_3 membranes 335
yields 515
- z**
- zeolite membranes 339ff, 389
– CO_2 separation 63, 319
– Linde type A (LTA) 341f
– precombustion 440
zeolite sodalite (SOD) membranes 342
zeolitic molecular sieves 246
zero emission ion transport membrane oxy-
gen power cycle (ZEITMOP) 418
zirconate-based membranes 319, 335, 340

