

Additional References with Titles

Chapter 3

- G.W. Alderton: Uranium enrichment. Arch. Energiewirtsch. **31**, 225 (1977)
- V.S. Belyanin: Thermophysical properties of uranium and tungsten hexafluorides. Teplofiz. Svoitsva Veshches **1**, 1–153 (1976) (in Russian)
- J.T. Bradbury: "Commercial developments in enrichment," American report ERDA CONF – 770109 No. 15 (1977)
- P. Brewington, Jr.: "Expansion of government capacity", American report ERDA CONF – 770109 No. 14 (1977)
- Y. Naruse: "Economic evaluation of the gaseous diffusion on uranium enrichment", Japanese report JAERI-M-7344 (1977) (in Japanese)
- M. Ohno, T. Morisue, O. Ozaki, T. Miyauchi: Gas separation performance of tapered cascade with membrane. J. Nucl. Sci. Techn. **15**, 411 (1978)
- J.E. Taphorn, A. Sugiura: "Time-of-flight mass spectrometer for monitoring light gases in a uranium enrichment cascade". American report GAT-922 (1978)
- E. von Halle: American report K/OA-4245 (1978) (complement to Ref. 3.124)
- E. von Halle: American report K/OA-4247 (1978) (complement to Ref. 3.239)
- Y. Maruse, H. Yoshida, S. Fujine, Y. Matsuda, Y. Maruyama, T. Tanaka, T. Aochi: "Separation of argon isotopes by porous membrane method". I. Design of Engineering Facility, Japanese report JAERI-M-7822 (1978)

Chapter 4

- F.H. Bark, T.H. Bark: On axially antisymmetric geostrophic flows in rapidly rotating gases. J. Mec. **18**, 47–72 (1979)
- J.J.H. Brouwers: On compressible flow in a rotating cylinder. J. Eng. Math. **12**, 265–285 (1978)
- J.J.H. Brouwers: On compressible flow in a gas centrifuge and its effect on the maximum separative power. Nucl. Technol. **39**, 311–322 (1978)
- I. Harada, N. Ozaki: A numerical study of source sink flows in a rotating cylinder. J. Phys. Soc. Japan **45**, 1400–1409 (1978)

Chapter 6

- A. F. Bernhardt: Isotope separation by laser deflection of an atomic beam. Appl. Phys. **9**, 19 (1976)
- U. Brinkmann, W. Hartig, H. Telle, H. Walther: Isotope selective photoionization of calcium using two-step laser excitation. Appl. Phys. **5**, 109 (1974/75)
- N. V. Chekalin, V. S. Dolzhikow, Yu R. Kolomisky, V. S. Letokhov, V. N. Lokhman, E. A. Ryabov: Experimental selection of molecules for isotope separation by multiple-photon dissociation in an intense ir field. Appl. Phys. **13**, 311 (1977)

- I.N.Knyazev, Yu A.Kudriavtzev, N.P.Kuzmina, V.S.Letokhov, A.A.Sarkisian: Laser isotope separation of carbon by multiple ir photon and subsequent uv excitation of CF_3I molecules. *Appl. Phys.* **17**, 427-429 (1978)
- R.V.Ambartzumian, N.P.Furzikov, V.S.Letokhov, A.A.Puretsky: Measuring photoionization cross-sections of excited atomic states. *Appl. Phys.* **9**, 335 (1976)
- B.Lehmann, M.Wahlen R.Zumbrunn, H.Oeschger, W.Schnell: Isotope analysis by infrared laser absorption spectroscopy. *Appl. Phys.* **13**, 153 (1977)
- R.V.Ambartzumian, N.P.Furzikov, V.S.Letokhov, A.P.Dyad'kin, A.Z.Grasyuk, B.I.Vasil'yev: Isotopically selective dissociation of CCl_4 molecules by NH_3 laser radiation. *Appl. Phys.* **15**, 27 (1978)
- V.N.Bagratashvili, Yu R.Kolomisky, V.S.Letokhov, E.A.Ryabov, V.Yu.Baranov, S.A.Kazakov, V.G.Nizjev, V.D.Pismenny, A.I.Starodubtsev, E.P.Velikhov: The application of a high pulse repetition rate CO_2 laser with high average power for isotope separation by molecular dissociation in a strong ir field. *Appl. Phys.* **14**, 217 (1977)

Subject Index

- Accommodation coefficients 62, 68, 84–89, 131
- Ad-on plant 160, 167
- Adsorption 65, 68, 87–92, 129
- Almelo 6
- Auxiliary gas 245

- Back pressure 57, 59, 142, 266
- Backscattering factor 62, 68, 72, 83, 86, 89
- Baffle 207, 212, 213, 236
- Barodiffusion 250
- Barrier 55, 60, 126–130
 - area 4, 5, 60, 61, 90, 115, 127, 129, 149, 163, 166
 - , composite 92
 - design 126
 - improvement 160, 165, 170
 - permeability 4, 61, 70, 78, 95, 107, 122, 129, 142
 - separation efficiency 58, 76, 79–87, 89, 93, 100, 130
 - separation equation 59, 79, 93
 - structure 60
 - efficiency 94
 - support layer 92–95
 - testing 81, 128–131
 - tortuosity factor 60, 66, 71, 85
 - transparency 92, 94
- BET equation 88, 129
- BGK equation 69, 73, 76
- BJH isotherm 129
- Boltzmann equation 63–76, 84, 248
- Boundary layer 98, 104
 - – method 191, 196–206
- Brinkman number 193
- Brownian motion 67, 72, 91

- Calutron 270
- Capenhurst 4, 6, 171
- Capillary 65–95
- Capital charge, gaseous diffusion 145, 148, 153, 158, 167
- Cascade 14, 252, 286
 - , asymmetric 8, 31, 32, 36, 119
 - , badger-cluster 134, 163, 164, 168
 - connections 134
- Cascade, countercurrent 14
 - design 260
 - , equilibrium time of a square 44
 - mixing losses 111
 - , squared-off 47, 50
 - square non-symmetric 38
 - , symmetric 19, 24
 - , tapering of a square 147, 152
- Cell diffusion length 96, 142
- Centrifuge, ionic 292
- Chapman's diffusion equation 64
- Chemical exchange 10
- Chemisorption 88
- Cohen's design equation 146
- Collision between molecules 60, 72, 76
 - – and walls 66, 72
 - integrals 63, 64
- Coolants 134, 135, 140, 164, 170
- Cooling system 119, 164–170
- Compressor 5, 55, 118, 131, 162–170
 - , axial 133, 162, 163, 170
 - , centrifugal 132, 162, 170
 - efficiency 133, 166, 172
 - failures 140
 - improvements 160, 165, 166, 172
 - motor (or shaft) power 150, 151, 162–164, 166, 170
 - , sealed 132, 170
 - , supersonic 133, 170
 - surge 139, 142, 143
 - volumetric capacity 115, 116
- Concentration field 184, 215, 235
- Concurrent flow 105, 110
- Contact ionization 291, 293
- Control valve 55, 118, 133, 140, 163
- Costs, gaseous diffusion 140–161
- Countercurrent flow 105, 109, 186, 195–197, 204, 207, 214
- Clousing equation 66, 67, 92
- Criticality 135, 137
- Cross flow 60, 97, 105–109, 111, 120
- Cut 16, 33, 96, 253
- Cyclotron resonance 313

- Debye-Waller effect 62
- Deflecting system, double 266, 267
- Diffuse reflection 62-77, 84, 87
- Diffuser 5, 55, 119, 134, 140, 162-168
- Diffusion cell 55, 96, 105, 106, 110
 - coefficient, ternary 249
 - , eddy or turbulent 99-105
 - equation 188, 215-235, 249
 - , forced 64
 - , mutual 64
 - pressure 64
 - temperature 96, 111-113, 142, 143
 - , thermal 64, 115
 - velocity 64, 76
- Distillation column 183, 188, 189, 219
- Drive 187, 194
- Drive scoop type 187
- Dusty gas model 61
- Dye laser 274, 275, 278

- Economics 140, 264, 285, 287
- Eddy diffusion 99-105
 - viscosity 100, 101
- Efficiency, separative 223
 - , thermodynamic 114
- Effusion 57-61
- Einstein's diffusion equation 73, 91
- Ejector 118
- Ekman compatibility conditions 201
 - layer 199-205
 - number 193
 - suction 201
- Energy consumption 111-116, 118, 120, 144, 154, 156, 162, 165, 169, 170, 251
 - economics 282
 - efficiency 270
 - recovery 155
- Energy requirements 298
- Enriching section 14, 217, 219, 220, 225
- Enrichment capacity forecast 3
 - factor 16, 96, 107
 - gains 16, 97, 105
- Environmental impact 140
- Equilibrium time 42, 44, 138, 139
- Euler-Lagrange equation 107

- Fick's equation 73, 90
- Flow, countercurrent 105, 109, 186, 195, 204, 207, 214
 - , free molecule 64-69
 - , interstage 111, 141-145, 148
 - , isothermal 57, 65, 76, 96
 - , orifice 57-61, 66, 68, 71, 75
 - parameters 151
 - rates 61, 65
 - , total 26, 28
- Friction factors 103, 104, 113
 - losses 113, 114, 143
- Gas law, deviation of UF₆ from ideal 123
- Grad 13-moment expansion 71
- Graham's laws 58, 85
- Gyrofrequency of electrons 295

- Heat exchanger 5, 55, 112, 119, 134, 148, 166, 170, 261
- Helikon technique 9
- Hydrodynamics equations 188, 189, 192, 193
 - methods 191, 207-209, 239-242
- Hypsometric density distribution 246

- Interdiffusion 72, 76
- Intermolecular potential 63, 123
- Inventory control 139, 168
- Ion cyclotron resonance 11, 291, 310
- Isotope transport 23

- Jet system, opposed 265

- Knudsen flow 63
 - layer 69, 72, 85, 89
 - number 65
 - permeability 68
- Lambert's law 62
- Laser characteristics 272
 - , chemical 275
 - , CO₂ 279
 - , Dye 274, 275, 278
 - -induced chemistry 284
 - , rare-gas halide 279
 - , semiconductor diode 274
 - , tunable 274, 279
- Lennard-Jones potential 61, 68, 88, 124
- Lorentz force 291-293, 311

- Mach number 190, 245
- Magnetic compression 311
- Manhattan Project 56, 269
- Maxwell mean velocity 57
- Mean free path 63, 64, 67, 69, 73, 122
 - velocity 64, 76
- MHD accelerator 278
- Mixing by molecular diffusion 98
 - - turbulence 99-105
 - efficiency 98-110, 130, 143
 - entropy 115
 - losses 114, 119, 147
- Mixture, isobaric 85, 87
 - , multicomponent 57, 117

- Molecular beam scattering 62
 - diameter 63, 85, 124, 131
 - diffusion 55, 64, 98-105
 - effusion 57-61
 - flow 65-69
 - permeability 65
 - probe, free 265
- Momentum transfer 58, 62, 68, 76, 104
- Multistage cluster arrangement 5

- Navier-Stokes equation 71, 101
- Nonproliferation 10
- Nuclear capacity 1
- Nusselt number 103

- Oak Ridge 4, 5, 7, 162, 165
- Outstream efficiency 153, 170, 172
- Optimization 227, 229, 231, 251
- Optimum control 66, 107, 146
 - thermal boundary conditions 230

- Paducah 4, 5, 164
- Peripheral speed 185
- Permeability, characteristic pressure 78, 80, 122, 131
 - profile 108, 142
 - radius 129
- Photochemistry 269
- Photodissociation 280, 284
- Photoetching for separation elements 256
- Photolysis, two-step 270
- Photon absorption, multiple infrared 272
- Photoreaction 280
- Pierrelatte 4, 170
- Plant efficiency 170
 - hold-up 139, 154
 - separative capacity 141, 159-171
- Plasma rotation 11, 312
 - viscosity 293
- Poiseuille flow 65, 70-72
- Pore distribution 129
 - length 60, 61, 66, 71
 - radius 60, 61, 86, 129-131, 142
 - section 57, 60
- Porosity 60, 61, 70, 84, 85, 129, 143
- Portsmouth 4, 5, 161, 162, 167
- Power consumption 5, 8, 9, 145-148, 155
 - optimization 145
- Prandtl number 63, 76, 122, 193
- Pressure diffusion 64
- Purge 136
 - cascade 83, 132, 135, 161, 163

- Rayleigh distillation factor 107, 130
- Recompression work 111-114, 120, 134

- Recycle, internal 119, 142
- Redox process 10
- Reflux, total 131, 139
- Residence time 87, 88, 91
- Reynolds number 101-103, 130
- Rigid body rotation 184
- Roots compressor 263
- Rossby number 193-195

- Scoop 186
- Schmidt number 63, 78, 81, 100-102, 122, 131
- Seals 125, 133, 137, 140
- Segment lengths intercepted by pore walls 61, 67, 85, 87, 129
- Self-diffusion 63, 72-76, 122
- Separation capacity 2
 - characteristic pressure 80-85, 89, 92, 122, 131, 142, 143
 - factor 10, 15, 58, 59, 69, 85, 96, 97, 106, 111, 119, 184, 185, 221, 226, 296
 - gain 16, 96, 97, 104, 111
 - nozzle 245
 - -, annular 265
 - radius 130
- Separative capacity 158-161, 165-171, 256
 - potential 39, 41
 - power 40, 110, 120, 144, 221, 222, 228, 229, 297, 298
 - work 23, 39, 42
- Sherwood number 98, 101-104
- Skimmer 250, 255
- Slip boundary layer 69, 72
 - coefficient 69
 - flow 65, 70-76
 - permeability 72
 - velocity 69, 74
- Specular reflections 62, 68, 72, 86
- Stage 14
 - efficiency 146
 - hold-up 116, 138
 - separation factor 15
 - volume 116
- Startup 135, 138
- Stewartson layer 202, 204
- Stream function 196, 202, 217, 227, 228
- Stripping section 14, 217, 220, 226
 - -, optimum size 52
- Suction flow 99
 - rate 101, 102, 114
 - Reynolds number 101, 103, 104, 130
 - velocity 98, 99
 - volume 116, 142, 251
- Superposition principle 186, 187
- Support layer 92-95, 128

Surface coverage 88-91
diffusion 90, 92, 131
permeability 90
viscosity 90

Transfer coefficient 219
unit height 219, 222

Transition flow 65, 72-87, 92

Tricastin 4, 5, 170

Tube Alloys Directorate Project 56

Turbulence 69, 99-105, 114, 121

Turnover time 116, 138

Two fluid model 306

UCOR process 247

Uranium arcs 301

inventory 10

URENCO-CENTEC 6

Value function 39, 221

Velocity persistence 84
profile 101

Virial coefficient of UF_6 123

Viscosity coefficient 63, 101, 121

Viscous flow 65, 69, 72, 74, 76

permeability 70, 72

Vortex 8, 247, 299

Wall blowing 110

suction 105, 110, 114

Wheel flow 184

Wind, thermal 199

Yield, absolute 30