

Contents

1	1 Introduction	1
1.1	Historical sketch	6
1.2	Interaction-induced absorption: the characteristics	13
1.3	Significance	17
1.4	Organization of the material	18
2	Recapitulation	20
2.1	Intermolecular potentials	20
2.2	Molecular collisions	23
2.3	Dimers and larger clusters	31
2.4	Distribution functions	36
2.5	Molecular multipoles	39
2.6	Spectral transforms	41
2.7	Dipole radiation	44
	1 Classical theory	44
	2 Quantum theory of radiation	47
2.8	Instrumentation	53
2.9	General references	54
3	Experimental results	56
3.1	The translational spectra	58
	1 Translational pair spectra	58
	2 Ternary and many-body translational spectra	67
	3 Virial expansions	72
	4 Dense fluids	75
3.2	The rototranslational spectra	81
	1 Rototranslational pair spectra	81
	2 Ternary rototranslational spectra	101
	3 Dense fluids	107
3.3	The rotovibrational spectra	109
	1 Rotovibrational pair spectra	111

viii	<i>Contents</i>	
	2 Ternary and many-body components	123
	3 Dense fluids	129
3.4	Collision-induced emission	131
3.5	Dipole autocorrelation function	133
3.6	Induced spectra and allowed transitions	133
3.7	Empirical line shapes	134
3.8	Analysis of measured spectra	138
3.9	General references	142
4	Induced dipoles	144
4.1	Overview	144
4.2	Theory	146
	1 Expansion coefficients	149
	2 Classical multipole approximation	152
4.3	Measurement	153
	1 Results	157
4.4	Computation	159
	1 Results	161
4.5	Miscellaneous remarks	184
4.6	Ternary dipoles	187
	1 Results	189
4.7	Asymptotic expressions	191
4.8	General references	194
5	Theory: monatomic gas mixtures	195
5.1	Ansatz	196
5.2	Spectral moments	199
	1 General relationships	200
	2 Virial expansion of spectral moments	203
	3 Binary moments	206
	4 Ternary moments	220
5.3	Virial expansion of line shape	225
5.4	Dipole autocorrelation function	230
5.5	Line shapes of diatomic systems	234
5.6	Classical diatom line shapes	246
5.7	Symmetry of line profiles	251
5.8	Intercollisional interference	257
5.9	Other approaches to line shape	266
5.10	Model line profiles	270
5.11	General references	277
6	Theory: molecular gases	279
6.1	Spectral moments	280
	1 Virial expansion	282
	2 Second and third binary moment	286
	3 Results: binary rototranslational moments	289
	4 Results: binary rotovibrational moments	290

	<i>Preface</i>	ix
	5 Ternary moments	295
6.2	Line shapes of pairs of linear molecules	304
	1 Isotropic potential approximation	308
	2 Computations and results	314
	3 Line shapes of systems with anisotropic interaction	329
	4 Spherical molecules	335
6.3	Asymmetry of line profiles	338
	1 Numerical computations and results	341
	2 Model line shapes	342
6.4	Dipole autocorrelation function	349
6.5	Intercollisional dip	349
6.6	Interference of allowed and induced lines	352
6.7	General references	354
7	Related topics	356
7.1	Collision-induced electronic spectra	356
	1 Early observations	357
	2 Theory	360
	3 Laser-assisted collisions	360
	4 Classification of electronic transitions	364
7.2	Collision-induced light scattering	366
7.3	Dielectric properties of gases	370
7.4	Astrophysical applications	371
7.5	Other applications	374
7.6	Summary	375
7.7	General references	376
	<i>Appendix</i>	377
	<i>References</i>	403
	<i>Index</i>	429