

Contents

CHAPTER 1	Group I: The Alkali and Coinage Metals	1
	<i>By J.L. Wardell</i>	
1	Alkali Metals	1
1.1	General	1
1.2	Alkyl Derivatives	1
1.3	Aryl Derivatives	2
1.4	Cyclopentadienyl and Related Derivatives	3
1.5	Benzyl and Related Derivatives	4
1.6	Alkenyl and Related Derivatives	5
2	Copper, Silver and Gold	5
2.1	π -Complexes of Copper, Silver and Gold	5
2.2	σ -Compounds of Copper	7
2.3	σ -Bonded Compounds of Silver and Gold	8
	References	9
CHAPTER 2	Group II: The Alkaline Earths and Zinc and its Congeners	14
	<i>By J.L. Wardell</i>	
1	General	14
2	Beryllium	14
3	Magnesium	14
4	Calcium, Strontium and Barium	16
5	Zinc	16
6	Cadmium	19
7	Mercury	20
	References	22
CHAPTER 3	Carbaboranes, Including their Metal Complexes	26
	<i>By C.E. Housecroft</i>	
1	Introduction	26
2	Theoretical and Spectroscopic Studies	26

3	Composition C_4B , C_4B_2 , C_3B_2 and C_2B_3 (including ring stacking)	27
4	Composition CB_4	29
5	Composition C_2B_4	29
6	Composition C_2B_5 , and C_3B_5	31
7	Composition CB_6 , CB_7 and CB_8	32
8	Composition C_2B_6 and C_2B_7	32
9	Composition C_2B_8	32
10	Composition CB_9 and CB_{11}	33
11	Composition C_2B_9	33
12	Composition C_2B_{10}	37
13	Studies Relating to BNCT	43
	References	45
CHAPTER 4	Group III: Boron, Aluminium, Gallium, Indium, and Thallium	48
	<i>By K.C. Molloy</i>	
1	Boron	48
	1.1 Non-cyclic Compounds	48
	1.2 Ring and Cage Structures	50
2	Aluminium, Gallium, and Indium	59
	2.1 Simple Organometallics and Organometallic Halides	59
	2.2 Compounds Containing M-Group 15 Element Bonds	62
	2.3 Compounds Containing M-Group 16 Element Bonds	68
	2.4 Derivatives Containing Transition Metals	71
	2.5 Material Science	74
3	Thallium	75
	3.1 Thallium(III)	75
	3.2 Thallium(I)	76
	References	76

<i>Contents</i>		ix
CHAPTER 5	Group IV: The Silicon Group	83
	<i>By D.A. Armitage</i>	
1	Introduction	83
2	The Carbon-Metalloid Bond	83
3	Catenation	100
4	Hydrides	104
5	Radicals, Anions, and Metal Derivatives	106
6	Nitrogen Derivatives	108
7	Phosphorus and Arsenic Derivatives	113
8	Oxygen Derivatives	114
9	Sulphur, Selenium, and Tellurium Derivatives	120
10	Halogen Derivatives	121
11	Complexes	122
	References	122
CHAPTER 6	Group V: Arsenic, Antimony, and Bismuth	151
	<i>By J.L. Wardell</i>	
1	Tervalent Compounds	151
2	Quinquevalent Species	153
	References	154
CHAPTER 7	Metal Carbonyls	157
	<i>By J.A. Timney</i>	
1	Introduction	157
2	Reviews	157
3	Theoretical, Spectroscopic, and General Studies	159
	3.1 Theoretical Studies	159
	3.2 Spectroscopic Studies	160
	3.3 General	161

4	Chemistry of Metal Carbonyls	162
4.1	Titanium, Zirconium, and Hafnium	162
4.2	Vanadium, Niobium, and Tantalum	163
4.3	Chromium, Molybdenum, and Tungsten	163
4.4	Manganese, Technetium, and Rhenium	165
4.5	Iron, Ruthenium, and Osmium	167
4.6	Cobalt, Rhodium, and Iridium	169
4.7	Nickel, Palladium, and Platinum	171
4.8	Copper, Silver, and Gold	171
4.9	Mixed Metal Carbonyls	171
5	Metal Carbonyls as Catalysts	173
6	Analysis of Literature Sources	173
	References	174
CHAPTER 8	Organometallic Compounds Containing Metal-Metal Bonds	184
	<i>By G. Hogarth</i>	
1	Introduction	184
1.1	Reviews	184
1.2	Theoretical Studies	185
1.3	Physical Studies	186
2	Compounds with Homonuclear Transition Metal Bonds	187
2.1	Group 4	187
2.2	Group 5	187
2.3	Group 6	188
2.4	Group 7	191
2.5	Iron	193
2.6	Ruthenium	197
2.7	Osmium	204
2.8	Cobalt	207
2.9	Rhodium and Iridium	209
2.10	Group 10	211
2.11	Group 11	212
3	Compounds with Heteronuclear Transition Metal Bonds	213
3.1	Binuclear Complexes	213
3.2	Tri and Higher Nuclearity Complexes	214
4	Compounds with Bonds Between Transition and Main Group Metals	215
4.1	Group 12	215
4.2	Group 13	217
4.3	Group 14	218
4.4	Group 15	219
	References	220

CHAPTER 9	Complexes Containing Metal-Carbon σ-Bonds of the Groups Scandium to Manganese, Including Carbenes and Carbynes	233
	<i>By M.L. Turner</i>	
1	Reviews and General Material	233
2	Group 3	236
3	Group 4	239
4	Group 5	253
5	Group 6	256
6	Group 7	274
	References	281
CHAPTER 10	Complexes Containing Metal-Carbon σ-Bonds of the Groups Iron, Cobalt, and Nickel, Including Carbenes and Carbynes	293
	<i>By S.J. Simpson</i>	
1	Introduction, Reviews and Articles of General Interest	293
2	Metal-Carbon σ -Bonds Involving Group 8, 9, and 10 Metals	293
	2.1 The Iron Triad	293
	2.2 The Cobalt Triad	297
	2.3 The Nickel Triad	304
3	Carbene and Carbyne Complexes of Groups 8, 9, and 10 Metals	316
	References	320
CHAPTER 11	Hydrocarbon-Metal π-Complexes, Other than π-Cyclopentadienyl and π-Arene Complexes	326
	<i>By D.G. Evans</i>	
1	Reviews	326
2	Allyl Complexes and Complexes Derived from Monoalkenes	326
	2.1 Cr, Mo, and W	326
	2.2 Fe, Ru, and Os	328
	2.3 Co, Rh, and Ir	330
	2.4 Ni, Pd, and Pt	334
	2.5 Other Metals	339

3	Complexes Derived from Unconjugated Dienes	341
3.1	Cr, Mo, and W; Fe, Ru, and Os	341
3.2	Co, Rh, and Ir	342
3.3	Ni, Pd, and Pt	347
4	Complexes Derived from Conjugated Dienes	348
4.1	Cr, Mo, and W	348
4.2	Fe, Ru, and Os	349
4.2.1	Acyclic Dienes	349
4.2.2	Cyclic Dienes	352
4.3	Co, Rh, and Ir	355
4.4	Other Metals	357
5	Alkyne Complexes	362
6	Polynuclear Complexes	368
6.1	Bimetallic Complexes	368
6.2	Polymetallic Complexes	377
	References	382
CHAPTER 12	π-Cyclopentadienyl, π-Arene and Related Complexes	396
	<i>By I.R. Butler</i>	
1	Introduction	396
2	Monocyclopentadienyls	396
2.1	Main Group, Lanthanide and Actinides	396
2.2	Titanium, Zirconium, and Hafnium	397
2.3	Vanadium, Niobium, and Tantalum	398
2.4	Chromium, Molybdenum, and Tungsten	399
2.5	Manganese, Rhenium, and Technetium	405
2.6	Iron, Ruthenium, and Osmium	408
2.7	Cobalt, Rhodium, and Iridium	419
2.8	Nickel, Palladium, and Platinum	424
2.9	Copper	424
3	Bis-cyclopentadienyl Derivatives	426
3.1	Lanthanides and Actinides	426
3.2	Titanium, Zirconium, and Hafnium	426
3.3	Vanadium, Niobium, and Tantalum	434
3.4	Chromium, Molybdenum, and Tungsten	435
3.5	Iron, Ruthenium, and Osmium	436
3.6	Cobalt, Rhodium, and Iridium	447
3.7	Nickel	447
4	Arenes	447
4.1	Chromium	447
4.2	Manganese	451
4.3	Iron, Ruthenium, and Osmium	451
4.4	Other Arenes	453
	References	455