

Contents

List of symbols	XII
Definitions, units and conversion factors	XVI
List of abbreviations	XVII
1 Magnetic properties of 3d, 4d and 5d elements, alloys and compounds	
1.1 3d elements	see subvolume III/19a
1.2 Alloys between 3d elements	see subvolume III/19a
1.3 4d and 5d elements, alloys and compounds	see subvolume III/19a
1.4 Alloys and compounds of 3d elements and 4d or 5d elements	see subvolume III/19a
1.5 Alloys and compounds of 3d elements with main group elements	
1.5.1 3d elements and Cu, Ag or Au	see subvolume III/19b
1.5.2 3d elements and Be, Mg, Zn or Hg	see subvolume III/19b
1.5.3 3d elements and B, Al, Ga, In or Tl	see subvolume III/19b
1.5.4 3d elements and C, Si, Ge, Sn or Pb (Y. NAKAMURA)	1
1.5.4.1 Introduction	1
1.5.4.2 Ti and V alloys and compounds	3
1.5.4.3 Cr alloys and compounds	7
1.5.4.4 Mn alloys and compounds	13
1.5.4.5 Fe alloys and compounds	24
1.5.4.5.1 Alloys and compounds with C and Si	24
1.5.4.5.2 Alloys and compounds with Ge	45
1.5.4.5.3 Alloys and compounds with Sn	55
1.5.4.6 Co and Ni alloys and compounds	61
1.5.4.7 MM'X ternary compounds	65
1.5.4.8 References for 1.5.4	71
1.5.5 Heusler alloys (P. J. WEBSTER, K. R. A. ZIEBECK)	75
1.5.5.1 Crystallographic structure	75
1.5.5.1.1 Chemical order	79
1.5.5.1.1.1 General model	79
1.5.5.1.1.2 A statistical model	82
1.5.5.1.1.3 Preferential disorder	82
1.5.5.1.2 Magnetic order	85
1.5.5.1.2.1 Ferromagnetic order	85
1.5.5.1.2.2 Antiferromagnetic order	86
1.5.5.2 Bulk magnetic properties	87
1.5.5.2.1 Introduction	87
1.5.5.2.2 Ferromagnets X_2MnZ	87
1.5.5.2.2.1 X_2MnZ with X=3d element	87
1.5.5.2.2.2 X_2MnZ with X=4d element	96
1.5.5.2.3 Antiferromagnets X_2MnZ	97
1.5.5.2.3.1 X_2MnZ with X=3d element	97
1.5.5.2.3.2 X_2MnZ with X=4d element	98
1.5.5.2.3.3 X_2MnZ with X=5d element	99
1.5.5.2.4 Ferromagnets X_2YZ for $Y \neq Mn$	100
1.5.5.2.4.1 Co_2YZ with Y=4A, 5A element	100
1.5.5.2.4.2 Co_2YZ with Y=6A, 7A element	103
1.5.5.2.4.3 Fe_2YZ with X=6A, 8A element	104
1.5.5.2.4.4 Fe_2FeZ	104
1.5.5.2.4.5 Mn_2VZ	109

1.5.5.2.5	Paramagnets X_2YZ with X, Y = 3d element	110
1.5.5.2.6	Quaternary alloys	111
1.5.5.2.6.1	$(XX^*)_2MnSn$ with X, $X^* = 3d$ elements	111
1.5.5.2.6.2	$Ni_2(Y Y^*)Sn$ with Y, $Y^* = 3d$ elements	112
1.5.5.2.6.3	$(XX^*)_2TiSn$ with X, $X^* = 3d$ elements	113
1.5.5.2.6.4	$(XX^*)_2MnSn$ with X = 3d, $X^* = 4d$ element	114
1.5.5.2.6.5	$(XX^*)_2MnAl$ with X = 3d, $X^* = 4d$ element	115
1.5.5.2.6.6	$Pd_2Mn(ZZ^*)$	116
1.5.5.2.7	Cl_b Intermetallic compounds XYZ	117
1.5.5.2.7.1	Ferromagnets $XMnZ$ with X = 3d element	118
1.5.5.2.7.2	Ferromagnets $XMnZ$ with X = 4d, 5d element	119
1.5.5.2.7.3	Ferromagnets – paramagnets $XYSb$ for $Y \neq Mn$	120
1.5.5.2.7.4	Antiferromagnets $XMnZ$ with X = 3d, 4d, 5d element	121
1.5.5.2.7.5	Quaternary alloys $(XX^*)MnSb$ with X, $X^* = 3d, 4d, 5d$ elements	121
1.5.5.2.7.6	$X_{2-x}MnSb$ with X = 3d, 4d element	123
1.5.5.3	Neutron diffraction and magnetic order	124
1.5.5.3.1	Introduction	124
1.5.5.3.2	Neutron diffraction theory	124
1.5.5.3.3	Magnetic and chemical ordering data	125
1.5.5.3.3.1	Co_2MnZ	125
1.5.5.3.3.2	Ni_2MnZ	127
1.5.5.3.3.3	Pd_2MnZ	129
1.5.5.3.3.4	Au_2MnZ	132
1.5.5.3.3.5	Cl_b compounds XYZ	134
1.5.5.3.4	Polarised neutron measurements on single crystals	139
1.5.5.3.4.1	X_2MnZ for $X \neq Co$	139
1.5.5.3.4.2	Fe_3Z	143
1.5.5.3.4.3	$Fe_{3-x}Mn_xSi$	145
1.5.5.3.4.4	Co_2YZ with Y = 3d element	147
1.5.5.4	Dynamics	149
1.5.5.4.1	Lattice dynamics	150
1.5.5.4.2	Phase transitions	151
1.5.5.4.3	Spin dynamics	152
1.5.5.5	Electrical properties	160
1.5.5.5.1	Electrical resistivity	160
1.5.5.5.2	Magnetoresistance	163
1.5.5.5.3	Hall effect	165
1.5.5.5.4	Thermoelectric power	167
1.5.5.6	Thermal properties	168
1.5.5.6.1	Specific heat	168
1.5.5.6.1.1	Cu_2MnZ	168
1.5.5.6.1.2	$Fe_{3-x}Mn_xSi$	169
1.5.5.6.1.3	$CoTi_{1-x}Al_x$	170
1.5.5.6.2	Superconductivity	171
1.5.5.7	Hyperfine fields	172
1.5.5.7.1	Introduction	172
1.5.5.7.2	Mössbauer spectra of Sn-doped alloys (^{119}Sn)	173
1.5.5.7.2.1	X_2MnIn with X = 1B, 8A element	173
1.5.5.7.2.2	$X_2MnSb, XMnSb$ with X = 8A element	174
1.5.5.7.3	Mössbauer spectra of Sb-based alloys (^{121}Sb), $X_2MnSb, XMnSb$ with X = 1B, 8A element	174
1.5.5.7.4	Mössbauer spectra of Sn-based alloys (^{119}Sn), Co_2YSn with Y = 4A element	175
1.5.5.7.5	DO_3 compounds Fe_3Z	176
1.5.5.7.6	DO_3-L2_1 compounds $Fe_{3-x}Y_xSi$ with Y = 5A, 7A, 8A element	178
1.5.5.7.7	$B2-L2_1$ compounds $Mn_{0.5}V_{0.5-x}Al_x$	181
1.5.5.8	References for 1.5.5	182

1.5.6	Metallic perovskites (PH. L'HÉRITIER, D. FRUCHART, R. MADAR, R. FRUCHART)	186
1.5.6.1	Introduction	186
1.5.6.2	Crystallographic properties of $M^cXM_3^f$ compounds	186
1.5.6.3	Magnetic and related data of $M^cXM_3^f$ compounds	195
1.5.6.3.1	M^cXTi_3	197
1.5.6.3.2	M^cXCr_3	197
1.5.6.3.3	M^cXMn_3	198
1.5.6.3.4	M^cXFe_3	245
1.5.6.3.5	M^cXCo_3	248
1.5.6.3.6	M^cXNi_3	248
1.5.6.4	References for 1.5.6	249
1.6	Alloys and compounds of 4d or 5d elements with main group elements (S. MISAWA, K. KANEMATSU)	254
1.6.1	General remarks	254
1.6.2	Alloys and compounds of Zr	257
1.6.2.1	ZrH_x	257
1.6.2.2	$ZrCuAl$	257
1.6.2.3	$ZrZn_2$	258
1.6.2.4	Other compounds of Zr	265
1.6.3	Alloys and compounds of Nb	266
1.6.3.1	Nb_4 hydride	266
1.6.3.2	A15 and σ -phase alloys of Nb	269
1.6.3.3	Nb carbides	271
1.6.3.4	Nb nitride	272
1.6.3.5	Nb chalcogenides	273
1.6.4	Alloys and compounds of Mo	276
1.6.4.1	Mo borides	276
1.6.4.2	$MoAlGe$	277
1.6.4.3	Mo carbides	277
1.6.4.4	Mo chalcogenides	277
1.6.5	Compounds of Ru	281
1.6.6	Alloys of Rh	284
1.6.7	Alloys and compounds of Pd	285
1.6.7.1	Pd hydrides	285
1.6.7.2	Pd–Li and Pd–Na compounds	288
1.6.7.3	fcc alloys of Pd	289
1.6.7.4	Other compounds of Pd	292
1.6.8	Alloys and compounds of Hf	293
1.6.8.1	Hf hydrides	293
1.6.8.2	$HfZn_2$	293
1.6.8.3	Hf carbides	294
1.6.8.4	Hf chalcogenides	294
1.6.9	Alloys and compounds of Ta	295
1.6.9.1	Ta hydrides	295
1.6.9.2	Ta carbides	296
1.6.9.3	Ta chalcogenides	297
1.6.10	Alloys and compounds of W	298
1.6.10.1	W borides	298
1.6.10.2	WP_4	298
1.6.10.3	W chalcogenides	298
1.6.11	Alloys and compounds of Re	298
1.6.12	Compounds of Os	299
1.6.13	Alloys and compounds of Pt	300
1.6.13.1	Pt–Li and Pt–Na compounds	300
1.6.13.2	fcc alloys of Pt	300
1.6.13.3	Other compounds of Pt	302
1.6.14	References for 1.6	304