

Table of contents

Magnetic properties of non-metallic inorganic compounds based on transition elements Subvolume a: Pnictides and chalcogenides I

1	Magnetic properties of pnictides and chalcogenides	1
1.1	Pnictides and chalcogenides based on 3d transition elements (K. ADACHI*, S. OGAWA**)	1
1.1.1	Introduction	1
1.1.1.1	General remarks	1
1.1.1.2	List of frequently used symbols and abbreviations	1
1.1.2	Compounds with pyrite, marcasite and arsenopyrite structures	7
1.1.2.1	MX_2 compounds with pyrite (FeS_2) type structure	8
1.1.2.1.1	MnX_2 ($X=S, Se, Te$)	15
1.1.2.1.2	FeX_2 ($X=S, Se, Te$)	18
1.1.2.1.3	CoX_2 ($X=S, Se, Te$)	20
1.1.2.1.4	NiX_2 ($X=S, Se, Te$)	28
1.1.2.1.5	CuX_2 ($X=S, Se, Te$)	33
1.1.2.1.6	ZnX_2 ($X=S, Se$)	36
1.1.2.2	$M_xM'_{1-x}X_2$ mixed systems with pyrite (C2) type structure	37
1.1.2.2.1	$Cr_xCo_{1-x}S_2$	37
1.1.2.2.2	$Mn_xM'_{1-x}X_2$ ($M'=Fe, Mg, Cu, Zn; X=S, Se, Te$)	37
1.1.2.2.3	$Fe_{1-x}M'_xS_2$ ($M'=Co, Ni$)	41
1.1.2.2.4	$Co_{1-x}Ni_xS_2$	45
1.1.2.2.5	$Ni_{1-x}Cu_xS_2$	46
1.1.2.3	$MS_{2-x}Se_x$ mixed systems with pyrite (C2) type structure	47
1.1.2.3.1	$CoS_{2-x}Se_x$	47
1.1.2.3.2	$NiS_{2-x}Se_x$	52
1.1.2.4	MY_xX_{2-x} and $M_{1-x}M'_xYX$ mixed systems with cobaltite or pyrite (C2) type structure	54
1.1.2.4.1	CoP_xS_{2-x}	55
1.1.2.4.2	$CoAs_xS_{2-x}$	56
1.1.2.4.3	$NiPS$	57
1.1.2.4.4	$NiAs_xS_{2-x}$	58
1.1.2.4.5	$Co_{1-x}Ni_xAsS$	58
1.1.2.5	$MX_2, MY_2, M_xM'_{1-x}Y_2$ and $MY_{2-x}X_x$ compounds with marcasite (C18) type structure	59
1.1.2.5.1	$CrSb_2$	60
1.1.2.5.2	FeP_2	61
1.1.2.5.3	$FeAs_2$	61
1.1.2.5.4	$FeSb_2$	61
1.1.2.5.5	$CoSb_2$	62
1.1.2.5.6	$CoTe_2$	63
1.1.2.5.7	$NiAs_2$ (β - $NiAs_2$)	63
1.1.2.5.8	$NiSb_2$	63
1.1.2.5.9	$M_{1-x}M'_xY_2$ ($M, M'=Cr, Fe, Ni; Y=As, Sb$)	64
1.1.2.5.10	$FeAs_{2-x}Se_x$	64
1.1.2.6	MY_xX_{2-x} and MY_2 compounds with arsenopyrite (E0 ₇) type structure	64
1.1.2.6.1	$FeSb_xTe_{2-x}$	64
1.1.2.6.2	CoP_2	64

* K. ADACHI, Department of Physics, Nagoya University, Nagoya 464, Japan

** S. OGAWA, Institute of Solid State Physics, Tokyo University, Roppongi, Minatu-ku, Tokyo 106, Japan

1.1.2.6.3	CoAs ₂	65
1.1.2.6.4	CoSb ₂	65
1.1.2.7	References for 1.1.2	65
1.1.3	Compounds with NiAs and MnP structures	70
1.1.3.1	M _{1-x} X chalcogenides with NiAs type structure and their mixed systems	70
1.1.3.1.1	Ti _{1-x} X (X=S, Se, Te)	81
1.1.3.1.2	V _{1-x} X (X=S, Se, Te)	81
1.1.3.1.3	Cr _{1-x} X (X=S, Se, Te)	83
1.1.3.1.4	MnX (X=S, Se, Te)	88
1.1.3.1.5	Fe _{1-x} X (X=S, Se, Te)	89
1.1.3.1.6	Co _{1-x} X (X=S, Se, Te)	92
1.1.3.1.7	Ni _{1-x} X (X=S, Se, Te)	93
1.1.3.1.8	References for 1.1.3.1	140
1.1.3.2	MY pnictides with MnP and NiAs type structures and their mixed systems	148
1.1.3.2.1	MP (M=V, Cr, Mn, Fe)	159
1.1.3.2.2	MAs (M=Ti, V, Cr, Mn, Fe, Co, Ni)	163
1.1.3.2.3	MSb (M=Ti, V, Cr, Mn, Fe, Co, Ni)	170
1.1.3.2.4	MBi (M=Mn, Ni)	180
1.1.3.2.5	Mn _{1-x} M _x P (M=V, Cr, Fe, Co)	182
1.1.3.2.6	MnP _{1-x} As _x	190
1.1.3.2.7	Mn _{1-x} M _x As (M=Ti, V, Cr, Fe, Co, Ni)	197
1.1.3.2.8	MnAs _{1-x} Sb _x	206
1.1.3.2.9	Mn _{1-x} M _x Sb (M=Ti, V, Cr, Fe, Co, Ni)	208
1.1.3.2.10	MnSb _{1-x} Sn _x	213
1.1.3.2.11	Arsenides containing Cr	214
1.1.3.2.12	Antimonides containing Cr	221
1.1.3.2.13	Other mixed pnictides containing Fe	224
1.1.3.2.14	References for 1.1.3.2	227
1.1.4	Compounds and mixed systems with Fe ₂ P and Cu ₂ Sb structures	232
1.1.4.1	M ₂ P compounds with Fe ₂ P type structure and their mixed systems	232
1.1.4.1.1	M ₂ P (M=Mn, Fe, Co, Ni)	236
1.1.4.1.2	Mixed system (M, M') ₂ P (M, M'=Co, Mn, Fe, Ni)	248
1.1.4.1.3	Fe ₂ As _x P _{1-x} and related systems containing As	261
1.1.4.1.4	Other mixed systems containing P	263
1.1.4.1.5	References for 1.1.4.1	264
1.1.4.2	M ₂ Y compounds with Cu ₂ Sb type structure and their mixed systems	265
1.1.4.2.1	M ₂ As (M=Cr, Mn, Fe)	269
1.1.4.2.2	M ₂ Sb (M=Mn, Cu)	270
1.1.4.2.3	MnMGe (M=Al, Ga)	273
1.1.4.2.4	(M, M') ₂ Y and M ₂ (Y, Y') compounds (M, M'=3d metals; Y, Y'=Sb, As)	275
1.1.4.2.5	Mn _{1-x} M _x (Al, Ga)Ge (M=3d metals)	284
1.1.4.2.6	References for 1.1.4.2	286
1.1.5	Chalcogenide spinels and their mixed systems	288
	References for 1.1.5	373
1.1.6	Other pnictides and chalcogenides	383
1.1.6.1	Chalcopyrite, CuFeS ₂ , and its Fe-substituted systems	383
1.1.6.2	Anti-CaF ₂ type antimonides, M'MSb, and their mixed systems	385
1.1.6.3	Heusler type antimonides, M' ₂ MSb, and their mixed systems	400
1.1.6.4	References for 1.1.6	423