$Mn_{52}(Mn_{0.1}Al_{0.9})_{14}Al_{218}$	*hP*586	(176) $P6_3/m$ – $i^{33}h^{30}fed$

$MnAl_4$ λ [1]
Structural features: A dense 3D-framework with mainly icosahedral coordination. So-called I3 units consisting of three vertex-linked icosahedra.

Kreiner G., Franzen H.F. (1997) [1]
$Al_{230.75}Mn_{53.30}$
a = 2.8382, c = 1.2389 nm, c/a = 0.437, V = 8.6428 nm^3, Z = 2

site	Wyck.	sym.	*x*	*y*	*z*	occ.	atomic environment
Al1	12*i*	1	0.0095	0.5635	0.0692		12-vertex polyhedron Mn_2Al_{10}
Al2	12*i*	1	0.0231	0.4721	0.1348		tricapped pentagonal prism $Al_{10}Mn_3$
Al3	12*i*	1	0.0273	0.2416	0.1361		tricapped pentagonal prism $Al_{10}Mn_3$
Al4	12*i*	1	0.0405	0.3884	0.055		12-vertex polyhedron Mn_2Al_{10}
Al5	12*i*	1	0.0406	0.1543	0.0578		14-vertex Frank-Kasper $Al_{12}Mn_2$
Al6	12*i*	1	0.0696	0.0871	0.0496	0.6	icosahedron Al_{12}
Al7	12*i*	1	0.0999	0.0424	0.1411	0.75	tricapped pentagonal prism $Al_{12}Mn$
Al8	12*i*	1	0.1121	0.343	0.0571		12-vertex polyhedron Mn_2Al_{10}
Mn9	12*i*	1	0.12742	0.25706	0.0744		icosahedron $Al_{11}Mn$
Al10	12*i*	1	0.1435	0.1705	0.1363		14-vertex Frank-Kasper $Al_{12}Mn_2$
Al11	12*i*	1	0.144	0.5474	0.135		tricapped pentagonal prism $Al_{10}Mn_3$
Al12	12*i*	1	0.157	0.4616	0.0564		12-vertex polyhedron Mn_2Al_{10}
Al13	12*i*	1	0.2011	0.063	0.0677		tricapped pentagonal prism Mn_2Al_{11}
Al14	12*i*	1	0.2134	0.3552	0.1349		tricapped pentagonal prism $Al_{10}Mn_3$
Al15	12*i*	1	0.232	0.2714	0.0629		tricapped pentagonal prism $Al_{10}Mn_3$
Mn16	12*i*	1	0.24449	0.56317	0.071		icosahedron $Al_{11}Mn$
Al17	12*i*	1	0.2465	0.1834	0.0695		12-vertex polyhedron Mn_2Al_{10}
Al18	12*i*	1	0.2594	0.4759	0.1358		tricapped pentagonal prism $Al_{10}Mn_3$
Al19	12*i*	1	0.3172	0.3719	0.0677		12-vertex polyhedron Mn_2Al_{10}
Al20	12*i*	1	0.3188	0.1362	0.0692		12-vertex polyhedron Mn_2Al_{10}
Al21	12*i*	1	0.3332	0.2858	0.1341		12-vertex polyhedron Mn_2Al_{10}
Al22	12*i*	1	0.3344	0.0463	0.1356		pseudo Frank-Kasper $Al_{10}Mn_3$
Al23	12*i*	1	0.3479	0.5802	0.057		14-vertex Frank-Kasper Mn_3Al_{11}
Al24	12*i*	1	0.3636	0.4906	0.0682		12-vertex polyhedron Mn_2Al_{10}
Al25	12*i*	1	0.4082	0.2398	0.1367		12-vertex polyhedron Mn_2Al_{10}
Al26	12*i*	1	0.4207	0.1494	0.0624		tricapped pentagonal prism $Al_{10}Mn_3$
Mn27	12*i*	1	0.43473	0.06194	0.0743		icosahedron $Al_{11}Mn$
Al28	12*i*	1	0.4506	0.3564	0.1363		12-vertex polyhedron $Al_{10}Mn_2$
Al29	12*i*	1	0.5072	0.2497	0.0681		12-vertex polyhedron Mn_2Al_{10}
Al30	12*i*	1	0.5188	0.1606	0.1372		
Al31	12*i*	1	0.537	0.0767	0.0652		tricapped pentagonal prism $Al_{10}Mn_3$
Al32	12*i*	1	0.6099	0.3269	0.1	0.78	
Al33	12*i*	1	0.622	0.1771	0.068		12-vertex polyhedron Mn_2Al_{10}
Al34	6*h*	*m*..	0.0517	0.3364	$^1/_4$		12-vertex polyhedron Mn_2Al_{10}
M35	6*h*	*m*..	0.0531	0.1007	$^1/_4$		14-vertex polyhedron $Al_{13}Mn$
Al36	6*h*	*m*..	0.0723	0.5711	$^1/_4$		12-vertex polyhedron Mn_2Al_{10}
Al37	6*h*	*m*..	0.0785	0.205	$^1/_4$		icosahedron Mn_4Al_8
Al38	6*h*	*m*..	0.0957	0.4529	$^1/_4$		12-vertex polyhedron Mn_2Al_{10}
Mn39	6*h*	*m*..	0.1188	0.3079	$^1/_4$		icosahedron $Al_{10}Mn_2$
Al40	6*h*	*m*..	0.1646	0.4068	$^1/_4$		12-vertex polyhedron Mn_2Al_{10}
Mn41	6*h*	*m*..	0.1661	0.022	$^1/_4$		icosahedron Al_{12}
M42	6*h*	*m*..	0.1823	0.2661	$^1/_4$		icosahedron Mn_5Al_7

Mn43	6*h*	*m*..	0.1922	0.5012	$^1/_4$		icosahedron $Al_{10}Mn_2$
Al44	6*h*	*m*..	0.1952	0.1213	$^1/_4$		12-vertex polyhedron Mn_2Al_{10}
Al45	6*h*	*m*..	0.2328	0.6036	$^1/_4$		icosahedron Al_8Mn_4
Mn46	6*h*	*m*..	0.2418	0.2192	$^1/_4$		icosahedron $Al_{11}Mn$
Al47	6*h*	*m*..	0.2665	0.0728	$^1/_4$		12-vertex polyhedron Mn_2Al_{10}
Mn48	6*h*	*m*..	0.2854	0.3315	$^1/_4$		icosahedron $Al_{11}Mn$
M49	6*h*	*m*..	0.295	0.5668	$^1/_4$		icosahedron Al_8Mn_4
Al50	6*h*	*m*..	0.306	0.4257	$^1/_4$		12-vertex polyhedron Mn_2Al_{10}
Al51	6*h*	*m*..	0.3102	0.1918	$^1/_4$		12-vertex polyhedron Mn_2Al_{10}
Mn52	6*h*	*m*..	0.3599	0.527	$^1/_4$		icosahedron Al_{12}
Mn53	6*h*	*m*..	0.362	0.1455	$^1/_4$		icosahedron $Al_{11}Mn$
Al54	6*h*	*m*..	0.3815	0.3796	$^1/_4$		12-vertex polyhedron Mn_2Al_{10}
Mn55	6*h*	*m*..	0.384	0.0019	$^1/_4$		icosahedron $Al_{10}Mn_2$
M56	6*h*	*m*..	0.4223	0.1055	$^1/_4$		icosahedron Mn_5Al_7
Mn57	6*h*	*m*..	0.4724	0.2119	$^1/_4$		
Al58	6*h*	*m*..	0.4872	0.0667	$^1/_4$		icosahedron Mn_5Al_7
Al59	6*h*	*m*..	0.5079	0.3105	$^1/_4$		14-vertex polyhedron Mn_2Al_{12}
Mn60	6*h*	*m*..	0.5498	0.0272	$^1/_4$		icosahedron $Al_{11}Mn$
Al61	6*h*	*m*..	0.5773	0.2487	$^1/_4$	0.53	
Mn62	6*h*	*m*..	0.5897	0.1364	$^1/_4$		icosahedron $Al_{11}Mn$
Al63	6*h*	*m*..	0.5991	0.2382	$^1/_4$	0.4	
M64	4*f*	3..	$^1/_3$	$^2/_3$	0.1188		16-vertex Frank-Kasper $Al_{13}Mn_3$
Al65	4*e*	3..	0	0	0.1378	0.74	10-vertex polyhedron Al_{10}
Mn66	2*d*	-6..	$^2/_3$	$^1/_3$	$^1/_4$		

M35 = 0.85Al + 0.15Mn; M42 = 0.95Al + 0.05Mn; M49 = 0.88Al + 0.12Mn; M56 = 0.94Al + 0.06Mn; M64 = 0.92Al + 0.08Mn
Experimental: single crystal, diffractometer, X-rays, wR = 0.059

Remarks: Short interatomic distances for partly occupied site(s). Preliminary account in [2].

References: [1] Kreiner G., Franzen H.F. (1997), J. Alloys Compd. 261, 83-104. [2] Franzen H.F., Kreiner G. (1993), J. Alloys Compd. 202, L21-L23.