Tables and figures

Table 1a. The amphibole group: general formulae, end-member names and compositions [91N1, 97L2, 03L1, 04L1].

Name	Composition	Group
Group 1		
Mg-Fe-Mn-Li amphiboles		
1a orthorhombic		
Anthophyllite	$\square Mg_7Si_8O_{22}(OH)_2$	VIIID06
Ferro-anthophyllite	$\square Fe^{2+}{}_7Si_8O_{22}(OH)_2$	VIIID06
Gedrite	$\square Mg_5Al_2Si_6Al_2O_{22}(OH)_2$	VIIID06
Ferrogedrite	$\square Fe^{2+}{}_5Al_2Si_6Al_2O_{22}(OH)_2$	VIIID06
Holmquistite	$\square (Li_2Mg_3Al_2)Si_8O_{22}(OH)_2$	VIIID06
Ferroholmquistite	$\square (Li_2Fe^{2+}{}_3Al_2)Si_8O_{22}(OH)_2$	VIIID06
1b monoclinic		
Cummingtonite	$\square Mg_7Si_8O_{22}(OH)_2$	VIII D05a
Grunerite	$\square Fe^{2+}{}_7Si_8O_{22}(OH)_2$	VIII D05a
Clinoholmquistite	$\square (Li_2Mg_3Al_2)Si_8O_{22}(OH)_2$	VIII D05a
Clinoferroholmquistite	$\square (Li_2Fe^{2+}{}_3Al_2)Si_8O_{22}(OH)_2$	VIII D05a
Pedrizite	$NaLi_2(LiMg_2Fe^{3+}Al)Si_8O_{22}(OH)_2$	VIII D05a
Ferropedrizite	$NaLi_2(LiFe^{2+}{}_2Fe^{3+}Al)Si_8O_{22}(OH)_2$	VIII D05a
Group 2		
Calcic amphiboles		
Tremolite	$\square Ca_2Mg_5Si_8O_{22}(OH)_2$	VIIID05b
Ferro-actinolite	$\square Ca_2Fe^{2+}{}_5Si_8O_{22}(OH)_2$	VIIID05b
Edenite	$NaCa_2Mg_5Si_7AlO_{22}(OH)_2$	VIIID05b
Ferro-edenite	$NaCa_2Fe^{2+}{}_5Si_7AlO_{22}(OH)_2$	VIIID05b
Pargasite	$NaCa_2(Mg_4Al)Si_6Al_2O_{22}(OH)_2$	VIIID05b
Ferropargasite	$NaCa_2(Fe^{2+}{}_4Al)Si_6Al_2O_{22}(OH)_2$	VIIID05b
Magnesiohastingsite	$NaCa_2(Mg_4Fe^{3+})Si_6Al_2O_{22}(OH)_2$	VIIID05b
Hastingsite	$NaCa_2(Fe^{2+}{}_4Fe^{3+})Si_6Al_2O_{22}(OH)_2$	VIIID05b
Tschermakite	$\square Ca_2(Mg_3AlFe^{3+})Si_6Al_2O_{22}(OH)_2$	VIIID05b
Ferrotschermakite	$\square Ca_2(Fe^{2+}{}_3AlFe^{3+})Si_6Al_2O_{22}(OH)_2$	VIIID05b
Aluminotschermakite	$\square Ca_2(Mg_3Al_2)Si_6Al_2O_{22}(OH)_2$	VIIID05b
Alumino-ferrotschermakite	$\square Ca_2(Fe^{2+}{}_3Al_2)Si_6Al_2O_{22}(OH)_2$	VIIID05b
Ferritschermakite	$\square Ca_2(Mg_3Fe^{3+}{}_2)Si_6Al_2O_{22}(OH)_2$	VIIID05b
Ferri-ferrotschermakite	$\square Ca_2(Fe^{2+}{}_3Fe^{3+}{}_2)Si_6Al_2O_{22}(OH)_2$	VIIID05b
Magnesiosadanagaite	$NaCa_2(Mg_3(Fe^{3+},Al)_2)Si_5Al_3O_{22}(OH)_2$	VIIID05b

Table 1a (cont.)

Name	Composition	Group
Sadanagaite	$NaCa_2(Fe^{2+}_3(Fe^{3+},Al)_2)Si_5Al_3O_{22}(OH)_2$	VIIID05b
Magnesiohornblende	$\square Ca_2(Mg_4(Al,Fe^{3+})Si_7AlO_{22}(OH)_2$	VIIID05b
Ferrohornblende	$\square Ca_2(Fe^{2+}_4(Al,Fe^{3+}))Si_7AlO_{22}(OH)_2$	VIIID05b
Kaersutite	$NaCa_2(Mg_4Ti)Si_6Al_2O_{23}(OH)$	VIIID05b
Ferrokaersutite	$NaCa_2(Fe^{2+}_4Ti)Si_6Al_2O_{23}(OH)$	VIIID05b
Cannilloite	$CaCa_2(Mg_4Al)Si_5Al_3O_{22}(OH)_2$	VIIID05b

Group 3

Sodic-calcic amphiboles:monoclinic

Richterite	$Na(CaNa)Mg_5Si_8O_{22}(OH)_2$	VIIID05c
Ferrorichterite	$Na(CaNa)Fe^{2+}_5Si_8O_{22}(OH)_2$	VIIID05c
Winchite	$\square(CaNa)Mg_4(Al,Fe^{3+})Si_8O_{22}(OH)_2$	VIIID05c
Ferrowinchite	$\square(CaNa)Fe^{2+}_4(Al,Fe^{3+})Si_8O_{22}(OH)_2$	VIIID05c
Barroisite	$\square(CaNa)Mg_3AlFe^{3+}Si_7AlO_{22}(OH)_2$	VIIID05c
Ferrobarroisite	$\square(CaNa)Fe^{2+}_3AlFe^{3+}Si_7AlO_{22}(OH)_2$	VIIID05c
Aluminobarroisite	$\square(CaNa)Mg_3Al_2Si_7AlO_{22}(OH)_2$	VIIID05c
Alumino-ferrobarroisite	$\square(CaNa)Fe^{2+}_3Al_2Si_7AlO_{22}(OH)_2$	VIIID05c
Ferribarroisite	$\square(CaNa)Mg_3Fe^{3+}_2Si_7AlO_{22}(OH)_2$	VIIID05c
Ferri-ferrobarroisite	$\square(CaNa)Fe^{2+}_3Fe^{3+}_2Si_7AlO_{22}(OH)_2$	VIIID05c
Magnesiokatophorite	$Na(CaNa)Mg_4(Al,Fe^{3+})Si_7AlO_{22}(OH)_2$	VIIID05c
Katophorite	$Na(CaNa)Fe^{2+}_4(Al,Fe^{3+})Si_7AlO_{22}(OH)_2$	VIIID05c
Magnesiotaramite	$Na(CaNa)Mg_3AlFe^{3+}Si_6Al_2O_{22}(OH)_2$	VIIID05c
Taramite	$Na(CaNa)Fe^{2+}_3AlFe^{3+}Si_6Al_2O_{22}(OH)_2$	VIIID05c
Alumino-magnesiotaramite	$Na(CaNa)Mg_3Al_2Si_6Al_2O_{22}(OH)_2$	VIIID05c
Aluminotaramite	$Na(CaNa)Fe^{2+}_3Al_2Si_6Al_2O_{22}(OH)_2$	VIIID05c
Ferri-magnesiotaramite	$Na(CaNa)Mg_3Fe^{3+}_2Si_6Al_2O_{22}(OH)_2$	VIIID05c
Ferritaramite	$Na(CaNa)Fe^{2+}_3Fe^{3+}_2Si_6Al_2O_{22}(OH)_2$	VIIID05c

Group 4

Sodic amphiboles: monoclinic

Glaucophane	$\square Na_2(Mg_3Al_2)Si_8O_{22}(OH)_2$	VIIID05d
Ferroglaucophane	$\square Na_2(Fe^{2+}_3Al_2)Si_8O_{22}(OH)_2$	VIIID05d
Magnesioriebeckite	$\square Na_2(Mg_3Fe^{3+}_2)Si_8O_{22}(OH)_2$	VIIID05d
Riebeckite	$\square Na_2(Fe^{2+}_3Fe^{3+}_2)Si_8O_{22}(OH)_2$	VIIID05d
Eckermannite	$NaNa_2(Mg_4Al)Si_8O_{22}(OH)_2$	VIIID05d
Ferro-eckermannite	$NaNa_2(Fe^{2+}_4Al)Si_8O_{22}(OH)_2$	VIIID05d
Magnesio-arfvedsonite	$NaNa_2(Mg_4Fe^{3+})Si_8O_{22}(OH)_2$	VIIID05d
Arfvedsonite	$NaNa_2(Fe^{2+}_4Fe^{3+})Si_8O_{22}(OH)_2$	VIIID05d
Obertiite	$NaNa_2(Mg_3Fe^{3+}Ti)Si_8O_{22}O_2$	VIIID05d

Table 1a (cont.)

Name	Composition	Group
Nyböite	$NaNa_2(Mg_3Al_2)Si_7AlO_{22}(OH)_2$	VIIID05d
Ferric-nyböite	$NaNa_2(Mg_3Fe^{3+}{}_2)Si_7AlO_{22}(OH)_2$	VIIID05d
Ferronyböite	$NaNa_2(Fe^{2+}{}_3Al_2)Si_7AlO_{22}(OH)_2$	VIIID05d
Ferric-ferronyböite	$NaNa_2(Fe^{2+}{}_3Fe^{3+}{}_2)Si_7AlO_{22}(OH)_2$	VIIID05d
Leakeite	$NaNa_2(Mg_2Fe^{3+}{}_2Li)Si_8O_{22}(OH)_2$	VIIID05d
Ferroleakeite	$NaNa_2(Fe^{2+}{}_2Fe^{3+}{}_2Li)Si_8O_{22}(OH)_2$	VIIID05d
Ungarettiite	$NaNa_2(Mn^{2+}{}_2Mn^{3+}{}_2)Si_8O_{22}O_2$	VIIID05d
Dellaventuraite	$NaNa_2(MgMn^{3+}{}_2Ti^{4+}Li)Si_8O_{22}O_2$	VIIID05d [05T1]
Kozulite	$NaNa_2(Mn^{2+}{}_4(Fe^{3+},Al))Si_8O_{22}(OH)_2$	VIIID05d
Kornite	$(Na,K)Na_2(Mg_2Mn^{3+}{}_2Li)Si_8O_{22}(OH)_2$	VIIID05d
Group 5		
Na-Ca-Mg-Fe-Mn-Li amphiboles		
Ottoliniite	$\square(NaLi)Mg_3Fe^{3+}Al)Si_8O_{22}(OH)_2$	
"Ferro-ottoliniite"	$\square(NaLi)(Fe^{2+}{}_3Fe^{3+}Al)Si_8O_{22}(OH)_2$	
Whittakerite	$Na(NaLi)(LiMg_2Fe^{3+}Al)Si_8O_{22}(OH)_2$	
"Ferrowhittakerite"	$Na(NaLi)(LiFe^{2+}{}_2Fe^{3+}Al)Si_8O_{22}(OH)_2$	

Table 1b. Prefixes additional to the figures 2 [97L2].

Prefix	Meaning	Applicable to
Alumino	Al > 1.00	Calcic and sodic-calcic groups only
Chloro	Cl > 1.00	all groups
Chromio	Cr > 1.00	all groups
Ferri	Fe^{3+} > 1.00	all groups except sodic
Fluoro	F > 1.00	all groups
Mangano	Mn^{2+} = 1.00…2.99	all groups except kozulite and ungarettiite
Permangano	Mn^{2+} = 3.00…4.99	all groups except kozulite
Magno	see text, section 5, Na-Ca-Mg-Fe-Mn-Li amphiboles	for group 1
Mangani	Mn^{3+} > 1.00	all groups except kornite and ungarettiite
Parvo	see text, section 5, Na-Ca-Mg-Fe-Mn-Li amphiboles	for groups 2, 3 and 4
Potassic	K > 0.50	all groups
Sodic	Na > 0.50	Mg-Fe-Mn-Li only
Titano	Ti > 0.50	all groups except kaersutite
Zinco	Zn > 1.00	all groups

Table 1c. Modifiers and their suggested ranges [97L2].

Prefix	Meaning 1)	Applicable to
Barian	Ba > 0.10	all groups
Borian	B > 0.10	all groups
Calcian	Ca > 0.50	Mg-Fe-Mn-Li
Chlorian	Cl 0.25…0.99	all groups
Chromian	Cr 0.25…0.99	all groups
Ferrian	Fe^{3+} 0.75…0.99	all groups except sodic. For sodic one 0.75…1.00
Fluorian	F 0.25…0.99	all groups
Hydroxylian	OH > 3.00	all groups
Lithian	Li > 0.25	all groups but excludes those defined by Li abundance
Manganoan	Mn^{2+} 0.25…0.99	all groups but excludes those defined by Mn^{2+} abundance
Manganian	Mn^{3+} or Mn^{4+} 0.25…0.99	ditto, Mn^{3+} abundance
Nickeloan	Ni > 0.10	all groups
Oxygenian	(OH+F+Cl) < 1.00	all groups except ungarettiite
Potassian	K 0.25…0.49	all groups
Plumbian	Pb > 0.10	all groups
Sodian	Na 0.25…0.49	Mg-Fe-Mn-Li only
Strontian	Sr > 0.10	all groups
Titanian	Ti 0.25…0.49	all groups
Vanadian	V > 0.10	all groups
Zincian	Zn 0.10…0.99	all groups
Zirconian	Zr > 0.10	all groups

1) in apfu

Table 1d. Site nomenclature for amphibole structure types [83H1]1).

Site	C2/m	$P2_1/m$	P2/a	Pnma	Pnmn
Tetrahedrally coordinated	T(1)	T(1A) T(1B)	T(1)A T(1)B	T1A T1B	T1
	T(2)	T(2A) T(2B)	T(2)A T(2)B	T2A T2B	T2
Octahedrally coordinated	M(1)	M(1)	M(1)A M(1)A	M1	M1
	M(2)	M(2)	M(2)A M(2)B	M2	M2
	M(3)	M(3)	M(3)	M3	M3
Cubic antiprismatic	M(4)	M(4)	M(4)A M(4)B	M4	M4
[12] cavity	A	A	A(2)	A	A
Nonbridging anions	O(1)	O(1A) O(1B)	O(1)A O(2)B	O1A O1B	O1
	O(2)	O(2A) O(2B)	O(2)A O(2)B	O2A O2B	O2
	O(3)	O(3A) O(3B)	O(3)	O3A O3B	O3
	O(4)	O(4A) O(4B)	O(4)A O(4)B	O4A O4B	O4
Bridging anions	O(5)	O(5A) O(5B)	O(5)A O(5)B	O5A O5B	O5
	O(6)	O(6A) O(6B)	O(6)A O(6)B	O6A O6B	O6
	O(7)	O(7A) O(7B)	O(7)	O7A O7B	O7

1) In the presentation, the parentheses were eliminated e.g. T(1)→T1.

Table 2. Atomic coordinates and temperature factors.

a) Holmquistite $Na_{0.04}Ca_{0.02}Li_{1.91}Mg_{1.98}Fe_{1.05}Mn_{0.03}Ti_{0.01}Al_{1.93}(Si_{7.87}Al_{0.13})O_{22}(OH)_2$, having space group Pnma [89W1].

Atom	*x*	*y*	*z*	B_{eq} [Å^2]
M1	0.1252(1)	0.1589(1)	0.3936(1)	0.56(1)
M2	0.1255(1)	0.0689(1)	–0.1053(1)	0.47(1)
M3	0.1254(1)	0.25	–0.1068(1)	0.51(1)
M4	0.1229(2)	–0.0097(2)	0.3964(6)	1.28(6)
T1A	0.2304(1)	–0.1619(1)	–0.4330(1)	0.47(1)
T1B	0.0190(1)	–0.1623(1)	0.2778(1)	0.48(1)
T2A	0.2265(1)	–0.0759(1)	0.0734(1)	0.47(1)
T2B	0.0242(1)	–0.0769(1)	–0.2138(1)	0.48(1)
O1A	0.1805(1)	0.1563(1)	0.0489(2)	0.63(2)
O1B	0.0701(1)	0.1559(1)	–0.2610(2)	0.62(2)
O2A	0.1844(1)	0.0753(1)	–0.4074(2)	0.64(2)
O2B	0.0653(1)	0.0747(1)	0.1964(2)	0.62(2)
O3A(OH)	0.1824(1)	0.25	–0.4470(3)	0.79(4)
O3B(OH)	0.0683(1)	0.25	0.2344(3)	0.75(4)
O4A	0.1873(1)	0.0044(1)	0.0607(2)	0.76(2)
O4B	0.0650(1)	0.0013(1)	–0.2680(2)	0.73(2)
O5A	0.1943(1)	–0.1143(1)	0.3367(2)	0.76(2)
O5B	0.0546(1)	–0.1130(1)	0.0518(2)	0.77(2)
O6A	0.2032(1)	–0.1302(1)	–0.1632(2)	0.83(2)
O6B	0.0464(1)	–0.1337(1)	–0.4474(2)	0.81(2)
O7A	0.2065(1)	–0.25	0.5417(3)	0.88(4)
O7B	0.0428(1)	–0.25	0.2426(3)	0.86(4)

b) Grunerite, $(Ca_{0.110}Mn_{0.142}Fe^{2+}_{6.685}Mg_{0.096})(Si_{7.968}Al_{0.016})O_{22}(OH)_2$; having C2/m-type structure, at 50 K [87G1].

Atom	*x*	*y*	*z*	B_{eq} [Å^2]	Occupancy factor
M1	0	0.089(1)	½	0.4(2)	0.96(3)
M2	0	0.174(1)	0	0.4	1
M3	0	0	0	0.4	1
M4	0	0.261(1)	½	0.4	0.84(3)
Si1	0.285(3)	0.087(1)	0.284(5)	–0.7(2)	1
Si2	0.290(3)	0.171(1)	0.792(5)	–0.7	1
O1	0.12(2)	0.082(1)	0.197(3)	–0.7	1
O2	0.132(2)	0.169(1)	0.715(3)	–0.7	1
O3	0.126(4)	0	0.708(7)	–0.7	1
O4	0.389(2)	0.237(1)	0.786(4)	–0.7	1
O5	0.347(2)	0.134(1)	0.052(3)	–0.7	1
O6	0.354(2)	0.120(1)	0.572(3)	–0.7	1
O7	0.337(2)	0	0.247(4)	–0.7	1
H	0.174(5)	0	0.698(11)	4.0(11)	1

Table 2 (cont.)

c) Ferri-ottoliniite $^{A}(K_{0.07}Na_{0.38})^{B}(Na_{0.70}Li_{1.24}Ca_{0.06})^{C}(Mg_{1.35}Fe^{2+}_{0.92}Mn^{2+}_{0.13}Zn_{0.31}Fe^{3+}_{1.71}Al_{0.10}Ti_{0.06}Li_{0.42})Si_8O_{22}$-$OH_{1.51}F_{0.47}$, having C2/m-type structure [04O1].

Atom	*x*	*y*	*z*	B_{eq} [Å^2]
M1	0	0.0882(1)	½	0.84
M2	0	0.1813(1)	0	0.68
M3	0	0	0	0.92
M4	0	0.2743(6)	½	2.62
M4'	0	0.2477(9)	½	1.92
Am	0.067(2)	½	0.136(4)	2.74
A	0	½	0	0.16
T1	0.2856(2)	0.0860(1)	0.2806(3)	0.76
T2	0.2957(1)	0.1707(1)	0.7895(3)	0.72
O1	0.1126(4)	0.0907(2)	0.2063(7)	0.86
O2	0.1213(4)	0.1726(2)	0.7326(7)	0.92
O3	0.1141(6)	0	0.7013(9)	1.23
O4	0.3727(4)	0.2502(2)	0.7868(7)	1.11
O5	0.3544(4)	0.1294(2)	0.0676(6)	0.96
O6	0.3454(4)	0.1204(2)	0.5658(6)	1.00
O7	0.3380(6)	0	0.2839(9)	1.07
H	0.204(9)	0	0.771(9)	0.51

d) Ferritaramite $(Na_{0.607}K_{0.381})(Ca_{1.176}Na_{0.792}Mn^{2+}_{0.032})(Fe^{2+}_{2.429}Mg_{0.866}Mn^{2+}_{0.153}Fe^{3+}_{1.307}Ti_{0.186}Al_{0.039})(Si_{6.178}Al_{1.822})$-$O_{22}(OH)_{1.910}$, having C2/m type structure [78H3].

Atom	*x*	*y*	*z*	B_{eq} [Å^2]
M1	0	0.08945(4)	½	0.84(2)
M2	0	0.17993(4)	0	0.66(2)
M3	0	0	0	0.74(2)
M4	0	0.28033(6)	½	0.89(2)
T1	0.27943(9)	0.8621(5)	0.3005(2)	0.56(1)
T2	0.29085(8)	0.17241(4)	0.8105(1)	0.53(1)
Am	0.0437(8)	½	0.0906(16)	1.8(1)
A2	0	0.4889(5)	0	1.8(1)
O1	0.1063(2)	0.0912(1)	0.2136(4)	0.85(3)
O2	0.1210(2)	0.1745(1)	0.7356(4)	0.82(3()
O3	0.1104(3)	0	0.7099(6)	0.94(5)
O4	0.3662(2	0.2499(1)	0.7939(4)	0.93(3)
O5	0.3494(2)	0.1364(1)	0.1004(5)	1.06(3)
O6	0.3425(2)	0.1189(1)	0.6015(5)	1.04(3)
O7	0.3353(4)	0	0.2886(7)	1.27(5)

Table 2 (cont.)

e) Manganocummingtonite (tirodite) $(Ca_{0.36}Na_{0.06})(Mg_{5.57}Mn_{0.96}Fe^{2+}_{0.01}Al_{0.01})Si_{8.02}O_{22}(OH)_2$, having $P2_1/m$-type structure [69P1 83H1].

Atom	*x*	*y*	*z*
M1	0.7503(4)	0.3369(1)	0.4931(6)
M2	0.7502(4)	0.4266(1)	0.9943()6)
M3	0.7488(7)	¼	0.9976(9)
M4	0.7480(3)	0.5139(1)	0.4916(4)
T1A	0.0367(3)	0.3348(1)	0.2731(4)
T1B	0.5363(3)	0.8340(1)	0.2854(4)
T2A	0.0438(3)	0.4208(1)	0.7805(4)
T2B	0.5462(3)	0.9197(1)	0.7915(4)
O1A	0.8661(7)	0.3367(3)	0.2056(10)
O1B	0.3623(6)	0.8355(4)	0.2196(10)
O2A	0.8695(7)	0.4232(3)	0.7154(10)
O2B	0.3734(7)	0.9206(3)	0.7223(10)
O3A	0.8595(10)	¼	0.7083(15)
O3B	0.3650(11)	¾	0.7106(15)
O4A	0.1216(8)	0.4982(4)	0.7866(11)
O4B	0.6273(8)	0.9972(3)	0.7706(11)
O5A	0.1001(7)	0.3762(4)	0.0534(11)
O5B	0.5997(7)	0.8859(4)	0.0834(10)
O6A	0.1012(7)	0.3743(4)	0.5480(11)
O6B	0.5981(7)	0.8682(4)	0.5747(11)
O7A	0.0997(10)	¼	0.2908(17)
O7B	0.5907(11)	¾	0.2742(17)

f) $Na(NaMg)Mg_5Si_8O_{22}(OH)_2$, having $P2_1/m$-type structure [04I1].

Atom	*x*	*y*	*z*	B_{eq} [Å^2]
M1	–0.2499(2)	0.3382(1)	0.4850(3)	0.65
M2	–0.2503(2)	0.4295(1)	0.9842(3)	0.66
M3	–0.2494(2)	¼	0.9859(4)	0.62
M4	–0.2461(3)	0.5054(1)	0.4840(5)	0.84
M4’	–0.2592(4)	0.5202(2)	0.4772(7)	1.17
T1A	0.0324(1)	0.3355(1)	0.2619(2)	0.54
T1B	0.5321(1)	0.8346(1)	0.2949(2)	0.52
T2A	0.0408(1)	0.4214(1)	0.7677(2)	0.53
T2B	0.5439(1)	0.9195(1)	0.7989(2)	0.67
A	0.2654(5)	¼	0.0462(11)	3.56
O1A	–0.1369(3)	0.3368(2)	0.1973(5)	0.58
O1B	0.3629(3)	0.8366(1)	0.2255(5)	0.57
O2A	–0.1302(3)	0.4217(2)	0.7018(5)	0.77
O2B	0.3734(3)	0.9219(1)	0.7355(5)	0.72
O3A	–0.1394(4)	¼	0.6943(7)	0.68

Table 2f (cont.)

Atom	*x*	*y*	*z*	B_{eq} [Å^2]
O3B	0.3577(4)	¾	0.7221(8)	0.72
O4A	0.1199(4)	0.4993(2)	0.7959(6)	1.16
O4B	0.6258(4)	0.9938(2)	0.7658(7)	1.80
O5A	0.0969(3)	0.3674(2)	0.0237(5)	1.00
O5B	0.6002(3)	0.8854(2)	0.0969(5)	0.97
O6A	0.0994(3)	0.3800(2)	0.5277(5)	1.07
O6B	0.5934(3)	0.8578(2)	0.5964(5)	1.07
O7A	0.0921(4)	¼	0.2998(8)	0.94
O7B	0.5904(4)	¾	0.2613(8)	0.83
H1	–0.053(10)	¼	0.751(19)	3.28
H2	0.566(9)	¼	0.241(17)	1.87

g) Protoamphibole, $Li_{0.64}Na_{0.05}Li_{0.48}Mg_{1.52}Mg_{5.00}Si_{7.93}O_{21.91}F_{2.09}$, having Pnmn type structure [60G1, 83H1].

Atom	*x*	*y*	*z*
M1	0	0.0883(1)	½
M2	0	0.1786(1)	0
M3	0	0	0
M4	0	0.2579(1)	½
T1	0.2868(2)	0.0847(1)	0.1720(3)
T2	0.2941(2)	0.1711(1)	0.6694(3)
O1	0.1155(4)	0.0851(2)	0.1659(7)
O2	0.1216(4)	0.1726(2)	0.6702(7)
O3	0.1032(5)	0	0.6640(9)
O4	0.1228(4)	0.2511(2)	0.1844(7)
O5	0.3475(5)	0.1212(3)	0.4292(9)
O6	0.3506(5)	0.1308(3)	0.9324(9)
O7	0.3494(6)	0	0.1592(11)

Table 3. Site occupancy in amphiboles at RT.

Sample	Space group	Site occupancy	Refs.
Magnesioholmquistite[1)]	Pnma	M1: $Mg_{0.52}Fe_{0.48}$; M2:$Al_{0.92}Mg_{0.08}$; M3: $Mg_{0.46}Fe_{0.54}$; M4 $Li_{0.90}Mg_{0.05}Na_{0.03}$; A: $(Ca,K)_{0.04}$	69W1
Holmquistite[2)]	Pnma	M1: $Mg_{0.71}Fe^{2+}_{0.29}$; M2: $Al_{0.99}Fe^{3+}_{0.01}$; M3: $Mg_{0.61}Fe^{2+}_{0.39}$; M4: $Li_{0.96}Na_{0.03}$; T1A:Si; T1B: Si; T2A:$Si_{0.98}Al_{0.02}$; T2B: $Si_{0.98}Al_{0.02}$	89W1
Ferroholmquistite[3)]	Pnma	M1: $Mg_{1.00}Fe^{2+}_{0.98}Mn^{2+}_{0.01}$; M2: $Al_{1.89}Fe^{2+}_{0.11}$; M3: $Fe^{3+}_{0.61}Mg_{0.39}$; M4: $Li_{1.88}Mg_{0.08}Na_{0.03}Fe^{2+}_{0.01}$; A: $Na_{0.01}K_{0.01}$; T1: $Si_{1.00}$; T2: $Si_{1.00}$	05C1

Table 3 (cont.)

Sample	Space group	Site occupancy	Refs.
Cummingtonite[4)]	C2/m	M1: $Fe^{2+}_{0.405}Mg_{0.595}$; M2: $Fe_{0.207}Mg_{0.789}Al_{0.004}$; M3: $Fe^{2+}_{0.393}Mg_{0.607}$; M4: $Fe_{0.927}Mg_{0.035}Ca_{0.038}$	98Y1
Cummingtonite[5)]	C2/m	M1: $Mg_{1.46}Fe^{2+}_{0.54}$; M2: $Mg_{1.76}Fe^{3+}_{0.14}Al^{3+}_{0.05}Ti_{0.05}$; M3: $Mg_{0.73}Fe^{2+}_{0.27}$; M4: $Fe^{2+}_{1.29}Mg_{0.10}Ca_{0.35}Mn_{0.16}Na_{0.10}$	71B1
Cummingtonite[6)]	C2/m	M1: $Mg_{1.52}Fe^{2+}_{0.48}$; M2: $Mg_{1.89}Fe_{0.11}$; M3: $Mg_{0.76}Fe^{2+}_{0.28}$; M4: $Mg_{0.14}Fe^{2+}_{1.65}Ca_{0.13}Mn_{0.08}$	67B2
Cummingtonite[7)]	C2/m	M1: $Mg_{0.84}Fe_{0.16}$; M2: $Mg_{0.95}Fe^{2+}_{0.05}$; M3: $Mg_{0.84}Fe^{2+}_{0.16}$; M4: $Mg_{0.17}Fe^{2+}_{0.83}$	66F1
Cummingtonite[8)]	C2/m	M1: $Mg_{0.67}Fe^{2+}_{0.33}$; M2: $Mg_{0.85}Fe^{2+}_{0.15}$; M3: $Mg_{0.67}Fe^{2+}_{0.33}$; M4: $Fe^{2+}_{0.75}Mg_{0.25}$	61G1
Zincian cummingtonite (tirodite)[9)]	C2/m	M1: $Zn_{0.252}Mg_{0.708}Mn_{0.039}$; M2: $Fe^{2+}_{0.165}Fe^{3+}_{0.020}Zn_{0.034}Mg_{0.781}$; M3: $Zn_{0.177}Mg_{0.722}Mn_{0.101}$; M4: $Mn_{0.710}Fe^{2+}_{0.045}Ca_{0.140}Na_{0.105}$; T1: $Si_{0.978}Al_{0.022}$; T2: $Si_{0.99}Fe^{3+}_{0.01}$	77H1
Tremolite[10)]		M1: $Mg_{0.99}Fe_{0.01}$; M2: $Mg_{0.99}Fe_{0.01}$; M3: $Mg_{0.99}Fe_{0.01}$; M4: Ca; A: vacant	91C1
Tremolite[11)]	C2/m	M1: Mg; M2: $Mg_{0.98}Al_{0.02}$; M3: Mg; M4: $Ca_{0.95}Na_{0.05}$; O3: $(OH)_{0.94}F_{0.06}$	69P1
Pargasite[12)]	C2/m	M1: $Mg_{0.945}Fe_{0.055}$; M2: $Mg_{0.725}Al_{0.15}Cr_{0.09}Ti_{0.035}$; M3: $Mg_{0.92}Fe_{0.08}$; M4: $Ca_{0.99}Fe_{0.01}$; A: $Na_{0.74}K_{0.02}$	91C1
Pargasite[13)]	C2/m	M1: $Mg_{0.81}Fe^{2+}_{0.19}$; M2: $Mg_{0.58}Fe^{3+}_{0.11}Al_{0.25}Ti_{0.06}$; M3: $Mg_{0.72}Fe^{2+}_{0.16}Fe^{3+}_{0.12}$; M4: $Ca_{0.95}Na_{0.03}Fe^{2+}_{0.02}$; A: $Na_{0.74}K_{0.07}$; T1: $Si_{0.54}Al_{0.46}$; T2: $Si_{1.00}$	78B1
Potassium pargasite[14)]	C2/m	M1: $Mg_{0.77}Fe_{0.23}$; M2: $Mg_{0.48}Fe_{0.20}Al_{0.27}Ti_{0.05}$; M3: $Mg_{0.76}Fe_{0.24}$; M4: $Ca_{1.00}$; Am: $Na_{0.315}K_{0.15}$; O3: $F_{0.42}O^{2-}_{0.58-x}(OH)_x$; T1: $Si_{0.62}Al_{0.38}$; T2: $Si_{0.91}Al_{0.09}$	73R1, 83H1
Kaersutite[15)]	C2/m	M1: $Mg_{0.39}Fe^{3+}_{0.32}Ca_{0.03}Ti_{0.26}$; M2: $Al_{0.17}Fe^{3+}_{0.18}Mg_{0.65}$; M3: $Mg_{0.93}Fe^{2+}_{0.01}Fe^{3+}_{0.06}$; M4: $Ca_{0.99}Mn_{0.01}$; T1: $Si_{0.57}Al_{0.43}$; T2: $Si_{0.90}Al_{0.10}$; A:$Na_{0.265}K_{0.205}$; H: $H_{0.51}$	89P1
Kaersutite[16)]	C2/m	M1: $Mg_{1.68}Ti_{0.32}$; M2: $Mg_{1.44}Ti_{0.07}Al_{0.49}$; M3: $Mg_{0.77}Ti_{0.04}Al_{0.19}$	99T2
Potassian-titanian-magnesiohastingsite[17)]	C2/m	M1: $Mg_{0.710}Fe^{2+}_{0.290}$; M2: $Mg_{1.144}Fe^{2+}_{0.188}$; M3: $Fe^{3+}_{0.528}Ti^{4+}_{0.210}$; M4: $Ca^{2+}_{0.950}Na^{+}_{0.05}$; A2: $Na^{+}_{0.170}K^{+}_{0.075}$; Am: $Na^{+}_{0.145}K^{+}_{0.100}$; T1: $Si^{4+}_{0.600}Al^{3+}_{0.400}$; T2: $Si^{4+}_{0.885}Al^{3+}_{0.115}$	81W1
Actinolite[18)]	C2/m	M1: $Mg_{0.39}Fe_{0.61}$; M2: $Mg_{0.34}Fe^{2+}_{0.46}Fe^{3+}_{0.16}Al_{0.04}$; M3: $Mg_{0.42}Fe_{0.58}$; M4: $Ca_{0.88}Mn_{0.08}Na_{0.04}$	71M1, 73M1
Fluoro-richterite[19)]	C2/m	M1: $Mg_{0.80}Fe_{0.20}$; M2: $Mg_{0.48}Fe_{0.52}$; M3:$Mg_{0.85}Fe_{0.15}$; M4: $Na_{0.51}Ca_{0.45}Fe_{0.04}$; A: $Na_{0.25}$; O3: $F_{1.00}$	71C1
Glaucophane[20)]	C2/m	M1: $Mg_{0.72}Fe_{0.28}$; M2: $Al_{0.80}Fe_{0.20}$; M3: $Mg_{0.54}Fe_{0.46}$; M4: $Na_{0.99}Li_{0.01}$; T1; T2:Si	91C1
Glaucophane[21)]	C2/m	M1: $Mg_{0.84}Fe^{2+}_{0.16}$; M2: $Al_{0.91}Fe^{3+}_{0.09}$; M3: $Mg_{0.71}Fe^{2+}_{0.29}$; M4: $Na_{0.98}Ca_{0.02}$	68P1

Table 3 (cont.)

Sample	Space group	Site occupancy	Refs.
Ferroglaucophane[22]	C2/m	M1: $Mg_{0.348}Fe^{2+}{}_{0.585}Al_{0.067}$; M2: $Fe^{3+}{}_{0.156}Al_{0.844}$; M3:$Fe^{2+}{}_{0.795}Mg_{0.205}$; M4: $Na_{0.860}Ca_{0.075}Mg_{0.065}$	79H1
Obertiite[23]	C2/m	M1A: $Ti_{0.86}Mn^{3+}(Fe^{3+})_{0.37}$; M1: $Mg_{0.77}$; M2: $Al_{0.03}Fe^{3+}{}_{0.30}Fe^{2+}{}_{0.35}Mg_{1.32}(Mn^{2+}{}_{0.31}Fe^{3+}{}_{0.28})$; M3: $Mg_{1.00}$; M4: $Fe^{2+}{}_{0.06}Na_{1.84}Ca_{0.08}(MN^{2+}{}_{0.06})$; Am: $K_{0.18}Na_{0.38}$; A2: $Na_{0.44}$	00H1
Fluor riebeckite[24]	C2/m	M1: $Fe^{2+}{}_{0.934}Fe^{3+}{}_{0.066}$; M2: $Fe^{3+}{}_{0.943}Al_{0.057}$; M3: $Li_{0.336}Mn_{0.182}Fe^{2+}{}_{0.482}$; M4: $Na_{0.993}Ca_{0.007}$; T1: $Si_{0.95}Al_{0.05}$; T2: $Si_{0.99}Al_{0.01}$; A: $K_{0.290}Na_{0.037}$; O3: $(OH)_{0.892}F_{1.253}$	78H1, 83H1
Kozulite[25]	C2/m	M1: $MN_{0.78}MG_{0.22}$; M2: $MN_{0.95}MG_{0.05}$; M3: $MN_{0.58}MG_{0.42}$; M4: $Na_{0.91}Ca_{0.09}$; A: $Na_{0.73}K_{0.27}$; MN = (Mg,Fe); MG = (Mg,Al)	72K1
Leakeite[26]	C2/m	M1: $Mg_{0.72}(Fe,Mn)_{0.28}$; M2: $Mg_{0.28}(Fe,Mn)_{0.72}$; M3: $Li_{0.83}Mg_{0.17}$; M4: $Na_{0.98}Ca_{0.02}$; A: $Na_{0.85}$	92H1
Dellaventuraite[27]	C2/m	M1:$Ti^{4+}{}_{0.60}Mn^{3+}{}_{0.63}Mg_{0.77}$; M2: $Fe^{3+}{}_{0.71}Mg_{1.00}Mn^{2+}{}_{0.19}Al_{0.10}$; M3: $Li_{0.90}Mn^{3+}{}_{0.03}Mg_{0.07}$; M4: $Na_{1.71}Ca_{0.29}$; Am: $Na_{0.60}$; Am': $K_{0.40}$	05T1
Ferri-ottoliniite[28]	C2/m	M1: $Mg_{1.21}Fe^{2+}{}_{0.55}Zn_{0.24}$; M2: $Fe^{3+}{}_{1.71}Al_{0.10}Ti^{4+}{}_{0.06}Zn_{0.07}Mg_{0.06}$; M3: $Li_{0.42}Mn^{2+}{}_{0.13}Fe^{2+}{}_{0.37}Mg_{0.08}$; only octahedral population	04O1
Ferriwhittakerite[29]	C2/m	M1: $Mg_{1.38}Fe^{2+}{}_{0.45}Zn_{0.17}$; M2: $Fe^{3+}{}_{1.48}Al_{1.10}Ti^{4+}{}_{0.12}Zn_{0.23}Mg_{0.07}$; M3: $Li_{0.73}Mn^{2+}{}_{0.12}Fe^{2+}{}_{0.13}Mg_{0.02}$; only octahedral population	04O1

1) $Na_{0.03}K_{0.01}Ca_{0.03}Li_{1.79}Mg_{1.76}Fe^{2+}{}_{1.21}Fe^{3+}{}_{0.24}Mn_{0.03}Ti_{0.02}Al_{1.84}(Si_{7.89}Al_{0.11})O_{22}(OH)_{1.86}F_{0.08}O^{2-}{}_{0.06}$;
2) $Na_{0.04}Ca_{0.02}Li_{1.91}Mg_{1.98}Fe_{1.05}Mn_{0.03}Ti_{0.01}Al_{1.93}(Si_{7.87}Al_{0.13})O_{22}(OH)_2$;
3) ${}^A(K_{0.01}Na_{0.01})^B(Li_{1.88}Mg_{0.08}Na_{0.03}Fe^{2+}{}_{0.01})^C(Al_{1.89}Fe^{2+}{}_{1.70}Mg_{1.39}Mn^{2+}{}_{0.02})Si_{8.00}O_{22}OH_{1.97}F_{0.03}$;
4) ${}^A(Ca_{0.076}Mg_{3.445}Fe_{3.272}Mn_{0.199}Al_{0.008})(Si_{7.983}Al_{0.017})O_{22}(OH)_2$;
5) $K_{0.019}Na_{0.142}Ca_{0.348}Mn_{0.158}Mg_{4.048}Fe^{3+}{}_{0.137}Fe^{2+}{}_{2.102}Ti_{0.050}Al_{0.054}(Si_{7.742}Al_{0.258})O_{22}(O,F,OH)_2$;
6) Metamorphic cummingtonite with 35.4 % Fe;
7) $(Mg,Fe)_7Si_8O_{22}(OH)_2$;
8) $(Mg_{4.05}Fe_{2.50}Mn_{0.17}Ca_{0.35})(Si_{7.9}Al_{0.1})O_{22}(OH)_2$;
9) $Na_{0.21}Ca_{0.28}Zn_{0.75}Mg_{3.70}Mn_{1.60}Fe^{2+}{}_{0.42}Fe^{3+}{}_{0.07}(Si_{7.87}Al_{0.09})O_{22}(OH)_2$;
10) $Ca_2(Mg_{4.95}Fe^{2+}{}_{0.05})Si_{8.00}O_{22}(OH)_2$;
11) $(K_{0.02}Na_{0.06})(Na_{0.04}Ca_{1.86})(Mg_{4.93}Mn_{0.05}Fe^{2+}{}_{0.02})Si_{7.95}Al_{0.05}O_{22}(OH)_{1.87}F_{0.13}$;
12) $K_{0.02}Na_{0.74}Ca_{1.98}Fe^{2+}{}_{0.02}(Mg_{4.26}Fe^{2+}{}_{0.19}Cr_{0.18}Ti_{0.07}Al_{0.30})(Si_{6.62}Al_{1.38})O_{22}(OH)_2$;
13) $(K_{0.058}Na_{0.828})(Na_{0.040}Ca_{1.872})(Mg_{3.414}Fe^{2+}{}_{0.814}Fe^{3+}{}_{0.429}Al_{0.431})(Si_{6.294}Al_{1.706})O_{22}(OH)_2$;
14) $(K_{0.30}Na_{0.63})Ca_{1.99}(Mn_{3.26}Mg_{0.01}Fe^{2+}{}_{1.08}Ti_{0.09}Al_{0.54})(Si_{6.14}Al_{1.86})O_{22}(OH,F)_2$;
15) $(K_{0.41}Na_{0.53})Ca_{2.06}(Mg_{3.10}Fe^{2+}{}_{0.01}Fe^{3+}{}_{1.06}Mn_{0.01}Ti_{0.52}Al_{0.34})(Si_{5.87}Al_{2.13})O_{22}(OH,F)_2$;
16) $Na_{0.804}K_{0.199}{}^B(Na_{0.085}Ca_{1.675}Mg_{0.240})^C(Mg_{3.892}Cr_{0.003}Ti_{0.428}Al_{0.677})(Si_{6.168}Al_{1.832})O_{22}(OH)_{1.356}F_{0.014}Cl_{0.008}O^{2-}{}_{0.622}$;
17) $(Ca_{1.90}Na_{0.10})(Na_{0.63}K_{0.35})(Mg_{3.07}Mn^{2+}{}_{0.02}Fe^{2+}{}_{0.68}Fe^{3+}{}_{0.86}Ti^{4+}{}_{0.35}Al_{0.02})(Si_{5.94}Al_{2.06})O_{22}(OH)_{1.60}$;
18) $(Ca_{0.875}Na_{0.04}Mn_{0.08})_2(Fe^{2+}{}_{0.506}Fe^{3+}{}_{0.06}Mg_{0.375}Mn_{0.044}Al_{0.014}Ti_{0.002}Cr_{0.002})_5(Si_{0.955}Al_{0.045})_8O_{22}(OH)_{1.97}F_{0.03}$;
19) $(Na_{1.0})(Na_{1.02}Ca_{0.90})(Mg_{3.45}Fe^{2+}{}_{1.68})Si_{7.97}O_{22}F_2$;
20) $Na_{1.98}Li_{0.02}(Mg_{1.98}Fe^{2+}{}_{1.02}Fe^{3+}{}_{0.40}Al_{1.60})Si_8O_{22}(OH)_2$;
21) $(Na_{1.96}Ca_{0.04})(Mg_{2.39}Fe^{2+}{}_{0.61}Fe^{3+}{}_{0.18}Al_{1.82})Si_8O_{22}(OH)_2$;
22) $(Na_{1.75}Ca_{0.15})(Mg_{1.03}Mn_{0.01}Fe^{2+}{}_{1.94}Fe^{3+}{}_{0.31}Ti_{0.01}Al_{1.83})(Si_{7.94}Al_{0.06})O_{22}(OH)_2$; from site population refinement;
23) $(K_{0.18}Na_{0.84})(Na_{1.86}Ca_{0.08}Fe^{2+}{}_{0.06})Mg_{3.09}Zn_{0.01}Li_{0.03}Fe^{3+}{}_{0.29}Mn^{3+}{}_{0.37}Fe^{2+}{}_{0.41}Ti^{4+}{}_{0.86}Al_{0.03})Si_{8.00}O_{22}(OH)_{0.20}$-$F_{0.26}O_{1.54}$;

Table 3 (cont.)

24) $(Na_{0.037}K_{0.290})(Ca_{0.013}Na_{1.987})(Mg_{0.011}Li_{0.334}Mn_{0.182}Fe^{2+}{}_{2.299}Fe^{3+}{}_{2.025}Ti_{0.016}Al_{0.103})(Si_{7.748}Al_{0.252})O_{22}F_{1.253}(OH)_{0.892}$;
25) $(Na_{2.54}K_{0.27}Ca_{0.19})(Mn_{3.69}Mg_{0.63}Fe^{3+}{}_{0.33}Al_{0.31})Si_{8.0}O_{21.78}(OH)_{2.18}F_{0.04}$;
26) $(K_{0.20}Na_{0.75})(Na_{1.92}Ca_{0.08})(Mg_{2.32}Fe^{3+}{}_{1.31}Mn^{3+}{}_{0.42}Al_{0.14}Li_{0.81})(Si_{7.93}Al_{0.07})O_{22}(OH)_{1.49}F_{0.51}$;
27) $(K_{0.40}Na_{0.61})(Na_{1.71}Ca_{0.29})(Mg_{1.81}Zn_{0.01}Ni_{0.02}Li_{0.90}Fe^{3+}{}_{0.71}Mn^{3+}{}_{0.85}Ti^{4+}{}_{0.60}Al_{0.10})(Si_{7.96}Al_{0.04})O_{22}(OH)_{0.80}O_{1.20}$;
28) $^{A}(K_{0.07}Na_{0.38})^{B}(Na_{0.70}Li_{1.24}Ca_{0.06})^{C}(Mg_{1.35}Fe^{2+}{}_{0.92}Mn^{2+}{}_{0.13}Zn_{0.31}Fe^{3+}{}_{1.71}Al_{0.10}Ti_{0.06}Li_{0.42})Si_8O_{22}OH_{1.51}F_{0.47}$;
29) $^{A}(K_{0.13}Na_{0.64})^{B}(Na_{1.27}Li_{0.62}Ca_{0.11})^{C}(Mg_{1.47}Fe^{2+}{}_{0.58}Mn^{2+}{}_{0.12}Zn_{0.40}Fe^{3+}{}_{1.48}Al_{0.10}Ti_{0.12}Li_{0.73})Si_8O_{22}OH_{1.30}F_{0.72}$.

Table 4. Crystal structures and lattice parameters.

Silicate	*T* [K]	Space group	Lattice parameters *a* [Å]	*b* [Å]	*c* [Å]	*β*	Refs.
Ferro-anthophyllite[1)]	RT		18.51_4	17.94_5	5.315_5		57S1
Magnesio-anthophyllite[2)]	RT	Pnma	18.536(3)	17.999(3)	5.277(1)		85K2
Anthophyllite[3)]	RT	Pnma	18.454	17.923	5.488		87M1
Anthophyllite[4)]	RT		18.576(5)	18.010(5)	5.258(2)		64L1
Anthophyllite[5)]	RT	Pnma	18.560	18.013	5.2818		73F1
Anthophyllite[6)]	RT	Pnma	18.544(2)	18.026(2)	5.282(1)		89W2
Anthophyllite[7)]	RT		18.5219(9)	17.9740(8)	5.2725(4)		01E1
Anthophyllite[8)]	RT		18.5705(9)	18.0361(8)	5.2876(2)		01E1
Protoferro-anthophyllite[9)]	RT	Pnmn	9.382(2)	18.390(4)	5.343(1)		98S1
Protomangano-ferro-anthophyllite[10)]	RT	Pnmn	9.425(2)	18.303(4)	5.345(1)		98S1
Gedrite[11)]	RT	Pnma	18.531(4)	17.741(4)	5.249(5)		70P1, 73P1
Gedrite[12)]	RT	Pnma	18.601(4)	17.839(3)	5.284(2)		70P1, 73P1
Holmquistite[13)]	RT	Pnma	18.30	17.69	5.30		60N1
Magnesioholmquistite[14)]	RT	Pnma	18.29	17.67	5.28		69W1
Holmquistite[15)]	RT	Pnma	18.254(2)	17.636(2)	5.270(1)		89W1
Ferroholmquistite[16)]	RT	Pnma	18.287(1)	17.680(1)	5.278(1)		05C1
Clinoholmquistite[17)]	RT	P2/m	9.80(2)	17.83(3)	5.30(1)	$70^0 54'$	65G3
Ferri-clinoholmquistite[18)]	RT	C2/m	9.428(1)	17.878(3)	5.282(1)	$102.26(2)^0$	04I2
Cummingtonite-grunerite[19)]	RT	C2/m	9.562(2)	18.380(7)	5.3380(35)	$101.860(26)^0$	64K1
Cummingtonite-grunerite[20)]	RT	C2/m	9.5380(18)	18.2480(96)	5.3490(59)	$101.970(26)^0$	64K1
Cummingtonite-grunerite[21)]	RT	C2/m	9.5270(17)	18.2380(62)	5.3260(46)	$101.950(34)^0$	64K1
Cummingtonite-grunerite[22)]	RT	C2/m	9.5730(26)	18.1150(54)	5.3040(73)	$102.350(59)^0$	64K1
Cummingtonite[23)]	RT	C2/m	9.6045(6)	18.1244(10)	5.3251(3)	$102.642(4)^0$	89G2
Cummingtonite[24)]	RT	C2/m	9.51	18.19	5.33	$101^0 55'$	61G1
Cummingtonite[25)]	RT	$P2_1/m$	9.550(1)	18.007(3)	5.298(1)	$102^0 39'$	73P2
Cummingtonite[26)]	RT		9.525(3)	18.202(4)	5.313(3)	$101.83(40)^0$	73K1
Cummingtonite[27)]	RT	C2/m	9.6063(4)	18.1262(5)	5.3168(2)	$102.632(1)^0$	73H3
Grunerite[28)]	RT	C2/m	9.5642(7)	18.393(2)	5.3383(3)	$101.892(3)^0$	69F1
Grunerite[29)]	RT	C2/m	9.593(1)	18.453(2)	5.343(1)	$101.98(2)^0$	87G1,
	4.5	C2/m	9.5542(2)	18.4202(4)	5.3327(1)	$102.276(2)^0$	65V1
	12	C2/m	9.5568(2)	18.4240(4)	5.3324(1)	$102.294(2)^0$	
	80	C2/m	9.5698(1)	18.4385(2)	5.3398(1)	$102.204(1)^0$	
Manganocummingtonite (tirodite)[30)]	RT	C2/m	9.583(2)	18.091(5)	5.315(4)	$102.63(2)^0$	69P1

Table 4 (cont.)

Silicate	*T* [K]	Space group	Lattice parameters *a* [Å]	*b* [Å]	*c* [Å]	*β*	Refs.
Manganocummingtonite (tirodite)[31a)]	RT	C2/m	9.595(1)	18.077(2)	5.307(1)	102.61(2)^0	72S1
Manganocummingtonite (tirodite)[31b)]	RT	$P2_1/m$	9.550(1)	18.007(3)	5.298(1)	102.65(2)^0	69P1
Zincian manganocummingtonite (tirodite)[32)]	RT	$P2_1/m$	9.606(1)	18.126(1)	5.317(1)	102.63(2)^0	77H1
Tremolite[33)]	RT	C2/m	9.810(2)	18.091(2)	5.294(2)	104.58(2)^0	95O2
Tremolite[34)]	RT	C2/m	9.863(1)	18.084(2)	5.285(1)	104.79(1)^0	76H2
Tremolite[35,36)]	RT		9.840	18.052	5.275	104.7^0	59Z1
Fluor tremolite[37)]	RT	C2/m	9.787(3)	18.004(2)	5.263(2)	104.44(2)^0	73C1
Hydroxyl-tremolite[38)]	RT	C2/m	9.818(5)	18.047(8)	5.275(3)	104.65(5)^0	69P1
Fluor tremolite[39)]	RT		9.781	18.007	5.267	104.5^0	54C1
Actinolite[40)]	RT	C2/m	9.8906(3)	18.1995(3)	5.3058(5)	104.639(4)^0	73M1
Actinolite[35,36)]	RT		9.861	18.111	5.336	105.0^0	59Z1
Actinolite[41)]	RT	C2/m	9.891(1)	18.200(1)	5.305(1)	104.64(1)^0	71M1
Actinolite[42)]	RT	C2/m	9.832(4)	18.078(10)	5.279(3)	104.62(4)^0	89S2
Actinolite[43)]	RT	C2/m	9.820(3)	18.079(6)	5.282(2)	104.59(3)^0	89S2
Actinolite[44)]	RT	C2/m	9.821(3)	18.089(6)	5.284(2)	104.51(3)^0	89S2
Ferro-actinolite[45)]	RT		9.9148(8)	18.217(1)	5.3083(5)	104.741(7)^0	02I1
Edenite[46)]	RT		9.8590(4)	18.0403(7)	5.2889(2)	104.872(2)^0	02I1
Edenite[47)]	RT	C2/m	9.802(2)	18.025(4)	5.281(1)	104.39(1)^0	91B1
Pargasite[48)]	RT	C2/m	9.869(2)	18.058(2)	5.320(2)	105.03(2)^0	95O2
Pargasite[49)]	RT	C2/m	9.870(2)	18.046(2)	5.318 (2)	105.04(2)^0	95O2
Pargasite[50)]	RT	C2/m	9.851(1)	17.981(2)	5.293(1)	105.070(7)^0	78B1
Pargasite[51)]	RT	C2/m	9.910(1)	18.022(1)	5.312(1)^0	105.78(1)^0	73R1
Pargasite – Ferropargasite $NaCa_2Mg_{4-x}Fe_xAlSi_6Al_2O_{22}(OH)_2$							
x = 0	RT	C2/m	9.892(1)	17.941(2)	5.277(1)	105^{0}33(1)'	80C1
x = 1	RT	C2/m	9.904(1)	17.989(5)	5.291(2)	105^{0}27(1)'	
x = 2	RT	C2/m	9.915(3)	18.031(7)	5.301(3)	105^{0}24(1)'	
x = 3	RT	C2/m	9.930(5)	18.104(6)	5.320(2)	105^{0}26(1)'	
x = 4	RT	C2/m	9.953(5)	18.152(3)	5.330(2)	105^{0}16(2)'	
Al-rich pargasite[52)]	RT		9.849(2)	17.972(5)	5.308(4)	105^{0}12(3)'	73B3
$NaCa_2Mg_4AlSi_6Al_2O_{22}(OH)_2$	RT	C2/m	9.904(3)	17.941(5)	5.281(2)	105.54(3)^0	87R2
$NaCa_2Mg_4CrSi_6Al_2O_{22}(OH_2)$	RT	C2/m	9.914(2)	17.993(4)	5.285(1)	105.44(2)^0	87R2
$NaCa_2Mg_4GaSi_6Al_2O_{22}(OH_2)$	RT	C2/m	9.849(2)	17.953(4)	5.297(1)	105.17(2)^0	87R2
$NaCa_2Mg_4ScSi_6Al_2O_{22}(OH_2)$	RT	C2/m	9.942(3)	18.101(5)	5.297(1)	105.37(2)^0	87R2
$NaCa_2Mg_4InSi_6Al_2O_{22}(OH)_2$	RT	C2/m	9.937(3)	18.030(4)	5.289(2)	105.54(2)^0	87R2
$NaCa_2Mg_4AlSi_6Al_2O_{22}F_2$	RT	C2/m	9.830(4)	17.919(6)	5.294(2)	105.16(3)^0	87R2
$NaCa_2Mg_4CrSi_6Al_2O_{22}F_2$	RT	C2/m	9.834(3)	17.971(5)	5.286(1)	105.07(2)^0	87R2
$NaCa_2Mg_4GaSi_6Al_2O_{22}F_2$	RT	C2/m	9.846(2)	17.951(4)	5.296(1)	105.16(2)^0	87R2
$NaCa_2Mg_4ScSi_6Al_2O_{22}F_2$	RT	C2/m	9.881(2)	18.145(4)	5.317(1)	105.17(2)^0	87R2
$Na_{037}K_{0.63}$ – pargasite[53)]	RT	C2/m	9.917	18.020	5.321	105.49^0	85M1
$Na_{064}K_{0.36}$ – pargasite[54)]	RT	C2/m	9.887	17.961	5.299	105.52^0	85M1
Potassian-titanian-magnesio-hastingsite[55)]	RT	C2/m	9.880(2)	18.012(4)	5.324(2)	105.26(2)^0	81W1
Magnesiohastingsite[56)]	RT	C2/m	9.856(2)	18.078(2)	5.311(2)	104.85(2)^0	95O2
Magnesiohastingsite[57)]	RT	C2/m	9.933(2)	18.029(4)	5.293(1)	105.43(1)^0	73S1
K-Ti-Mg hastingsite[58)]	RT	C2/m	9.870(1)	18.058(4)	5.307(2)	105.20(2)^0	69P1

Table 4 (cont.)

Silicate	*T* [K]	Space group	Lattice parameters *a* [Å]	*b* [Å]	*c* [Å]	*β*	Refs.
Sadanagaite[59)]	RT	C2/m	10.00(1)	18.06(2)	5.355(4)	105.52(7)^0	89S1
Sadanagaite [60)]	RT	C2/m	9.922(10)	18.03(2)	5.352(9)	105.30(10)^0	84S1
Magnesiosadanagaite [61)]	RT	C2/m	9.964(2)	18.008(3)	5.354(2)	105.55(2)^0	84S1
Kaersutite[62)]	RT	C2/m	9.8903(3)	19.0596(5)	5.3152(2)	105.4(1)^0	89P1
Potassian oxy-kaersutite[63)]	RT		9.807(3)	18.017(6)	5.307(2)	105.43(2)^0	71K1
Kaersutite[64)]	RT		9.892(1)	18.064(2)	5.3116(7)	105.388(5)^0	73H2
Kaersutite[65)]	RT		9.860(4)	17.984(6)	5.291(2)	105.24(3)^0	99T2
Kaersutite[66)]	RT		9.903(4)	17.995(8)	5.304(3)	105.44(3)^0	99T2
Magnesiohornblende[67)]	RT	C2/m	9.856(2)	18.078(2)	5.311(2)	104.85(2)^0	95O2
Magnesiohornblende[68)]	RT	C2/m	9.780(6)	17.908(2)	5.293(2)	104.93(7)^0	71L1
Pargasitic hornblende[69)]	RT	C2/m	9.818(1)	17.972(2)	5.300(1)	104.886(3)^0	78B1
Ferroan-pargasitic hornblende[70)]	RT	C2/m	9.832(3)	18.037(5)	5.302(1)	105.01(2)^0	80H1
Crossite[71)]	RT	C2/m	9.8163(6)	17.839(2)	5.2813(4)	104.373(6)^0	88H2
Richterite[72)]	RT	C2/m	9.902(2)	17.980(4)	5.269(1)	104^{0}12.7(1.1)’	68P2
Richterite[73)]	RT		9.8231(8)	17.9571(12)	5.2671(9)	104^{0}20’	55K1
Richterite[74)]	RT		10.012	17.911	5.279	108^{0}23’	69W2
Richterite[75)]	RT		9.929	17.914	5.274	108^{0}16’	62G1
Richterite[76)]	RT		9.891(2)	18.018(2)	5.276(2)	104.15(2)^0	93O1
Richterite[77)]	RT		9.892(2)	18.027(2)	5.278(2)	104.09(2)^0	93O1
Richterite[78)]	RT		9.909(2)	18.030(2)	5.278(2)	104.23(2)^0	93O1
Richterite[79)]	RT		9.966(2)	18.066(2)	5.279(2)	104.40(2)^0	93O1
Richterite[80)]	RT		9.909(1)	17.978(5)	5.268(1)	104^{0}13(2)’	71F1
Richterite[81)]	RT		10.172(3)	18.201(7)	5.290(1)	104^{0}32(2)’	70H1, 74C1
Potassium richterite[82)]	RT		10.0547(8)	17.997(1)	5.274(6)	104^{0}15(9)’	97H1
Sodic richterite[83)]	RT		9.9073(16)	17.9794(38)	5.2685(11)	104^{0}15.06(90)’	70H1
Potassic richterite[84)]	RT		10.0486(19)	17.9880(30)	5.2722(13)	104^{0}48.09(55)’	70H1
Potassic richterite[85)]	RT	C2/m	10.1926(5)	18.1209(3)	5.2736(2)	105.514(5)^0	99Y1
Potassic ferri-ferrorichterite[86)]	RT	C2/m	10.145(1)	18.184(1)	5.296(1)	104.42(1)^0	02R2
Mg-Fe richterites $NaCa_2Mg_{5-x}Fe_xSi_8O_{22}(OH)_2$							
x = 0	RT	C2/m	9.902(1)	17.980(4)	5.269(1)	104^{0}13(1)’	74C1
x = 1	RT	C2/m	9.917(2)	18.020(5)	5.277(1)	104^{0}8(3)’	
x = 2	RT	C2/m	9.935(4)	18.063(3)	5.284(2)	104^{0}5(3)’	
x = 3	RT	C2/m	9.962(5)	18.122(6)	5.292(2)	104^{0}4(2)’	
x = 4	RT	C2/m	9.980(7)	18.180(7)	5.297(5)	103^{0}58(2)’	
x = 5	RT	C2/m	9.982(7)	18.233(6)	5.298(5)	103.44(7)^0	
Fluor richterite[87)]	RT	C2/m	9.824(3)	17.968(3)	5.263(1)	104.22(1)^0	71C1
Winchite[88)]	313	C2/m	9.7573(6)	17.9026(14)	5.2886(2)	103.814(4)^0	86G1
Ferritaramite[89)]	RT	C2/m	9.923(1)	18.134(2)	5.352(1)	104.84(1)^0	78H3
Potassium magnesiokatophorite[90)]	RT	C2/m	10.019(2)	18.036(7)	5.286(3)	104.98(3)^0	69P1
Glaucophane[91)]	RT	C2/m	9.541(2)	17.740(3)	5.295(2)	103^{0}40(1)’	68P1
Glaucophane[92)]	RT		9.554(8)	17.738(19)	5.298(7)	103.72(11)^0	70E1
Ferroglaucophane[93)]	RT	C2/m	9.587(4)	17.832(7)	5.315(2)	103.47(3)^0	79H1
Magnesioriebeckite [94)]	RT	C2/m	9.760(8)	18.070(19)	5.339(7)	103.66(11)’	70E1

Table 4 (cont.)

Silicate	*T* [K]	Space group	Lattice parameters *a* [Å]	*b* [Å]	*c* [Å]	*β*	Refs.
Magnesioriebeckite[95)]	RT	C2/m	9.727(8)	17.958(19)	5.306(7)	103.75(11)’	70E1
Fluor riebeckite[96)]	RT	C2/m	9.811(3)	18.013(5)	5.326(2)	103.68(1)^0	78H1
Riebeckite (crocidolite)[36,39)]	RT		9.74	17.95	5.30	103.9^0	59Z1
Arfvedsonite[97)]	RT	C2/m	10.007(2)	18.077(2)	5.332(1)	104.101(7)^0	76H1
Arfvedsonite[98)]	RT		9.774(15)	18.029(9)	5.332(7)	103.7(1)^0	96S1
Magnesio-arfvedsonite[99)]	RT	C2/m	9.7624(8)	17.9136(22)	5.2874(6)	103.837(8)^0	86G1
Fluoro-magnesio-arfvedsonite[101)]	RT	C2/m	9.81(9)	18.01(3)	5.28(1)	103.8(2)^0	00B1
$Na_3Mg_5Si_8O_{21}(OH)_3$	293	C $\bar{1}$ or C1	9.9313(5)	18.111(1)	5.3017(3)	α = 89.766(3)^0 β = 103.035(3)^0 γ = 90.271(4)^0	96L1, 91M1
	513	C2/m	9.9937(8)	18.1978(2)	5.3093(4)	103.602(5)^0	
$(Na_{0.97}\square_{0.07})(Na_{0.94}Mg_{1.06})Mg_5$-$Si_8O_{22}(OH)_2$	8	$P2_1/m$	9.70169(17)	17.89537(36)	5.25744(10)	102.597(2)^0	05I1
(synthetic by ND)	293	$P2_1/m$	9.71887(15)	17.93853(31)	5.26923(9)	102.526(1)^0	
$Na(NaMg)Mg_5Si_8O_{22}(OH)_2$	RT	$P2_1/m$	9.689(1)	17.938(2)	5.268(5)	102.50(3)^0	04I1
$NaMg_4[Si_6O_{15}OH](OH)_2$	RT		10.132(5)	27.12(1)	5.257(5)	106^{0}54(10)’	75D1
Obertiite[102)]	RT	C2/m	9.776(2)	17.919(3)	5.292(1)	104.05(2)^0	00H1
Kozulite[103)]	RT	C2/m	9.914	18.111	5.308	104.50^0	72K1
Nyböite[104)]	RT	C2/m	9.665(1)	17.752(2)	5.303(1)	104.11(1)^0	81U1
Fluoro-nyböite[105)]	RT	C2/m	9.666(4)	17.799(6)	5.311(2)	104.10(3)^0	03O1
Leakeite[106)]	RT	C2/m	9.822(3)	17.836(6)	5.286(2)	104.37(3)^0	92H1
Ferripedrizite[107)]	RT	C2/m	9.501(1)	17.866(2)	5.292(1)	102.17(2)^0	02C1
Sodic ferripedrizite[108)]	RT	C2/m	9.536(1)	17.789(2)	5.277(1)	102.53^0	00O1
Fluoro-sodic pedrizite[109)]	RT	C2/m	9.368(8)	17.616(10)	5.271(4)	102.38(4)^0	05O1
Ungarettiite[110)]	RT	C2/m	9.89(1)	18.04(3)	5.29(1)	104.6(2)^0	95H3
Ferri-ottoliniite[111)]	RT	C2/m	9.535(3)	17.876(6)	5.294(2)	102.54(5)^0	04O1
Ferriwhittakerite[112)]	RT	C2/m	9.712(9)	17.851(23)	5.297(2)	103.63(5)^0	04O1
Dellaventuraite[113)]	RT	C2/m	9.808(1)	17.840(2)	5.2848(5)	104.653(1)^0	05T1

1) $(K_{0.01}Na_{0.33}Mg_{0.01}Mn_{0.31}Fe^{2+}{}_{4.40}Fe^{3+}{}_{0.35}Ti_{0.06}Al_{1.68})(Al_{1.97}Si_{6.03})O_{21.79}(OH)_{2.15}F_{0.06}$;
2) $Mg_{6.3}Fe_{0.7}Si_8O_{22}(OH)_2$;
3) Natural sample. Composition not mentioned;
4) Composition not mentioned;
5) $Mg_{5.53}Fe^{2+}{}_{1.47}Si_8O_{22}(OH)_2$;
6) $Na_{0.01}Ca_{0.02}Mg_{5.71}Fe_{1.24}Mn_{0.02}Si_{7.95}Al_{0.05}O_{22}(OH)_2$;
7) ${}^ANa_{0.021}{}^{B+C}(Ca_{0.069}Ni_{0.015}Mn_{0.014}Mg_{6.142}Fe_{0.704}Cr_{0.016}Ti_{0.001}Al_{0.039})(Si_{7.923}Al_{0.077})O_{22}(OH)_{1.992}$;
8) ${}^A(Na_{0.023}K_{0.002})^{B+C}(Na_{0.007}Ca_{0.097}Ni_{0.011}Mn_{0.041}Mg_{5.299}Fe_{1.454}Cr_{0.021}Ti_{0.003}Al_{0.067})(Si_{7.888}Al_{0.112})O_{22}OH_{1.995}Cl_{0.002}F_{0.013}$;
9) $(Fe_{0.80}Mn_{0.20})_2(Fe_{0.98}Mg_{0.02})_5(Si_4O_{11})_2(OH)_2$;
10) $(Fe_{0.30}Mn_{0.70})_2(Fe_{0.82}Mg_{0.18})_5(Si_4O_{11})_2(OH)_2$;
11) $(Na_{0.47}Ca_{0.03})(Al_{1.21}Mg_{4.52}Fe^{2+}{}_{1.14}Mn_{0.02}Ti_{0.06})(Si_{6.25}Al_{1.75})O_{22}(OH)_2$;
12) $(Ca_{0.042}Na_{0.544}K_{0.007})(Al_{1.365}Mg_{3.009}Fe^{2+}{}_{2.351}Fe^{3+}{}_{0.140}Mn_{0.031}Ti_{0.026}Li_{0.018}Cr_{0.002})(Si_{5.953}Al_{2.047})O_{22}(OH)_2$;
13) $(Li_{1.90}Na_{0.05}K_{0.03}Ca_{0.08})(Mg_{2.01}Mn_{0.02}Fe^{2+}{}_{0.99})(Al_{1.75}Fe^{3+}{}_{0.03}Ti_{0.02})Si_{7.92}O_{22.06}(OH)_{1.84}F_{0.10}$;
14) $(Li_{1.79}Na_{0.03}K_{0.01}Ca_{0.03})(Mg_{1.76}Fe^{2+}{}_{1.21}Fe^{3+}{}_{0.24}Mn_{0.03}Ti_{0.02}Al_{1.84})(Si_{7.89}Al_{0.11})O_{22}(OH)_{1.86}F_{0.08}O^{2-}{}_{0.06}$;
15) $Li_{1.91}Na_{0.04}Ca_{0.02}Mg_{1.98}Fe_{1.05}Mn_{0.03}Ti_{0.01}Al_{1.93}(Si_{7.87}Al_{0.13})O_{22}(OH)_2$;
16) ${}^A(K_{0.01}Na_{0.01})^B(Li_{1.88}Mg_{0.08}Na_{0.03}Fe^{2+}{}_{0.01})^C(Al_{1.89}Fe^{2+}{}_{1.70}Mg_{1.39}Mn^{2+}{}_{0.02})Si_{8.00}O_{22}(OH)_{1.97}F_{0.03}$;
17) $(Na_{0.45}Ca_{0.05}K_{0.04})(Li_{1.79}Ca_{0.21})(Al_{2.21}Mg_{1.93}Fe^{2+}{}_{0.68}Li_{0.08}Fe^{3+}{}_{0.05}Mn_{0.05})Si_{8.00}O_{22}O_{0.98}F_{0.74}(OH)_{0.28}$;

Table 4 (cont.)

18) ${}^{A}\square{}^{B}Li_2{}^{C}(Mg_3Fe^{3+}{}_2)Si_{8.00}O_{22}(OH)_2$ prepared at $T = 700°C$, $p = 0.55$ GPa;
19) $Ca_{0.06}Mg_{0.77}Mn_{0.05}Fe_{6.14}Si_{8.00}O_{22}(OH)_{1.39}F_{0.51}$;
20) $Ca_{0.16}Mg_{2.37}Mn_{0.09}Fe_{4.44}(Si_{7.95}Al_{0.02})O_{22}(OH)_{2.04}$;
21) $K_{0.04}Na_{0.02}Ca_{0.02}Mg_{2.46}Mn_{0.03}Fe_{4.42}Al_{0.02}(Si_{7.97}Al_{0.03})O_{22}(OH)_{2.02}$;
22) $Na_{0.03}Ca_{0.19}Mg_{3.69}Mn_{1.63}Fe_{1.35}Al_{0.02}Si_{8.02}O_{22}(OH)_{1.99}F_{0.10}$;
23) $Ca_{0.24}Mn_{2.41}Mg_{1.20}Fe_{2.15}Si_{8.00}O_{22}(OH)_2$;
24) $(Mg_{4.05}Fe_{2.50}Mn_{0.17}Ca_{0.35})(Si_{7.9}Al_{0.1})O_{22}(OH)_2$;
25) $(Ca_{0.36}Na_{0.06}Mn_{0.96}Mg_{0.57})Mg_5Si_8O_{22}(OH)_2$;
26) $K_{0.005}Na_{0.015}Ca_{0.092}Mg_{3.256}Mn_{0.097}Fe^{2+}{}_{3.157}Fe^{3+}{}_{0.184}Al_{0.052}Ti_{0.004}Si_{8.035}O_{22}(OH)_{1.901}$;
27) $Na_{0.21}Ca_{0.28}Mg_{3.70}Fe^{2+}{}_{0.42}Mn_{1.60}Zn_{0.75}Fe^{3+}{}_{0.07}Al_{0.09}Si_{7.87}O_{22}(OH)_2$;
28) $Ca_{0.06}Mg_{0.77}Mn_{0.05}Fe^{2+}{}_{6.14}Si_8O_{22}F_{0.84}(OH)_{1.16}$;
29) $(Ca_{0.110}Mn_{0.142}Fe^{2+}{}_{6.685}Mg_{0.096})(Si_{7.968}Al_{0.016})O_{22}(OH)_2$;
30) $Na_{0.03}Ca_{0.18}(Mg_{4.11}Mn_{2.02}Fe^{2+}{}_{0.54})Si_{7.95}Al_{0.05}O_{22}F_{0.34}(OH)_{1.66}$;
31a) $Na_{0.06}Ca_{0.36}(Mg_{5.57}Mn_{0.96}Fe^{2+}{}_{0.01}Al_{0.01})Si_{8.02}O_{22}(OH)_2$;
31b) Composition [%]: SiO_2 – 58.31; Al_2O_3 – 0.06; FeO – 0.13; MnO – 8.24; MgO – 27.17; CaO – 2.46; Na_2O – 0.22;
32) $Na_{0.21}Ca_{0.28}Mg_{3.70}Mn_{1.60}Zn_{0.75}Fe^{2+}{}_{0.42}Fe^{3+}{}_{0.07}Al_{0.09}Si_{7.87}O_{22}(OH)_2$;
33) $(Ca_{1.660}Na_{0.058}\square_{0.282})(Na_{0.095}K_{0.040})(Al_{0.217}Ti_{0.001}Cr^{3+}{}_{0.002}Fe^{3+}{}_{0.302}Fe^{2+}{}_{1.103}Mn^{2+}{}_{0.027}Mg_{3.626}Ni_{0.002}Zn_{0.002})$-$(Si_{7.392}Al_{0.608})O_{22}(OH)$;
34) $Na_{0.383}K_{0.119}Ca_{1.802}Mg_{5.0}(Si_{7.767}Al_{0.228})O_{22}F_{0.660}Cl_{0.012}(OH)_{1.337}$;
35) natural sample;
36) a and b ± 0.05 %, c and β ± 0.1 %;
37) $Ca_2Mg_5Si_8O_{22}F_2$ synthetic sample;
38) $(K_{0.02}Na_{0.06})(Na_{0.04}Ca_{1.86})(Mg_{4.93}Mn_{0.05}Fe^{2+}{}_{0.02})(Si_{7.95}Al_{0.05})O_{22}(OH)_{1.87}F_{0.13}$;
39) natural sample;
40) $(Ca_{0.875}Na_{0.04}Mn_{0.08})_2(Fe^{2+}{}_{0.506}Fe^{3+}{}_{0.06}Mg_{0.372}Mn_{0.044}Al_{0.014}Ti_{0.002}Cr_{0.002})_5(Si_{0.955}Al_{0.045})_8O_{22}(OH)_{1.97}F_{0.03}$;
41) $(Ca_{0.875}Na_{0.04}Mn_{0.08})_2(Fe^{2+}{}_{0.506}Fe^{3+}{}_{0.06}Mg_{0.375}Mn_{0.044}Al_{0.014}Ti_{0.002}Cr_{0.002})_5(Si_{0.955}Al_{0.045})_8O_{22}(F_{0.03}(OH)_{1.97})$;
42) $Ca_{2.00}Fe_{0.35}Mg_{4.65}Si_8O_{22}(OH)_2$;
43) $Ca_{1.92}Fe_{0.35}Mg_{4.73}Si_8O_{22}(OH)_2$;
44) $Ca_{1.75}Fe_{0.65}Mg_{4.60}Si_8O_{22}(OH)_2$;
45) $(K_{0.034}Na_{0.088})(Na_{0.049}Ca_{1.930})(Mn_{0.021})(Mn_{0.211}Fe^{2+}{}_{2.915}Mg_{1.578}Ti_{0.005}Al_{0.291})(Si_{7.625}Al_{0.375})O_{22}(OH)_2$;
46) $(K_{0.111}Na_{0.498})(Na_{0.092}Ca_{1.908})(Mn_{0.021}Fe^{3+}{}_{1.034}Mg_{3.520}Ti_{0.028}Al_{0.346})(Si_{7.181}Al_{0.819})O_{22}(OH)_2$;
47) $(Na_{0.47}K_{0.01}Ca_{0.03})(Ca_{1.03}Mn_{0.97})(Mg_{4.55}Mn_{0.31}Al_{0.10}Fe_{0.04})(Si_{7.49}Al_{0.51})O_{22.13}(OH)_{1.87}$;
48) $(Ca_{1.846}Na_{0.048}\square_{0.106})(Na_{0.378}K_{0.100})(Al_{0.354}Ti_{0.210}Cr^{3+}{}_{0.001}Fe^{3+}{}_{0.308}Fe^{2+}{}_{1.228}Mn^{2+}{}_{0.020}Mg_{2.982}Na_{0.002}Zn_{0.001})$-$(Si_{6.488}Al_{1.512})O_{22}(OH)_{1.958}F_{0.042}$;
49) $(Ca_{1.825}Na_{0.019}\square_{0.156})(Na_{0.462}K_{0.099})(Al_{0.303}Ti_{0.325}Cr^{3+}{}_{0.003}Fe^{3+}{}_{0.200}Fe^{2+}{}_{1.245}Mn^{2+}{}_{0.020}Mg_{3.058}Zn_{0.002})(Si_{6.307}Al_{1.693})$-$O_{22}(OH)_{1.958}F_{0.042}$;
50) $(K_{0.058}Na_{0.828})(Na_{0.040}Ca_{1.872})(Mg_{3.414}Fe^{2+}{}_{0.814}Fe^{3+}{}_{0.429}Al_{0.431})(Si_{6.294}Al_{1.706})O_{22}(OH)_2$;
51) $(Na_{0.626}Ca_{0.302})(Ca_{0.990})_2(Mg_{0.651}Fe_{0.215}Al_{1.07}Ti_{0.018}Mn_{0.02})_5(Si_{0.767}Al_{0.233})_8O_{23.16-x}(OH)_{2x}F_{0.841}$;
52) $Na_{0.67}K_{0.17}Ca_{1.99}Mg_{3.62}Fe_{0.07}Ti_{0.27}Al_{1.12}Si_{5.75}Al_{2.25}O_{22}(OH)_{1.05}F_{0.58}Cl_{0.02}$;
53) $(Na_{0.37}K_{0.63})(Ca_{1.99}Na_{0.01})(Mg_{3.13}Fe^{2+}{}_{0.62}Fe^{3+}{}_{0.22}Al_{0.97}Ti_{0.05})(Si_{5.99}Al_{2.01})O_{23}$;
54) $(Na_{0.64}K_{0.36})(Ca_{1.99}Na_{0.03})(Mg_{3.10}Fe^{2+}{}_{0.66}Fe^{3+}{}_{0.23}Al_{0.95}Ti_{0.06})(Si_{6.01}Al_{1.99})O_{23}$;
55) $(K_{0.35}Na_{0.63})(Ca_{1.90}Na_{0.10})(Al_{0.02}Ti^{4+}{}_{0.35}Fe^{3+}{}_{0.86}Fe^{2+}{}_{0.68}Mn_{0.02}Mg_{3.07})(Si_{5.94}Al_{2.06})O_{22}(OH)_{1.60}$;
56) $(Na_{0.283}K_{0.128})(Ca_{1.787}\square_{0.207})(Al_{0.250}Ti_{0.154}Cr^{3+}{}_{0.01}Fe^{3+}{}_{0.133}Fe^{2+}{}_{1.536}Mn^{2+}{}_{0.021}Mg_{3.109}Zn_{0.004})(Si_{6.923}Al_{1.077})O_{22}$-$(OH)_{1.953}F_{0.047}$;
57) $NaCa_2Mg_4Fe^{3+}Si_6Al_2O_{22}(OH)_2$ synthetic;
58) $(K_{0.39}Na_{0.62})(Ca_{1.63}Na_{0.25})(Mg_{2.85}Mn_{0.01}Fe^{2+}{}_{0.84}Fe^{3+}{}_{0.54}Ti_{0.49}Al_{0.39})(Si_{5.97}Al_{2.03})O_{22}F_{0.06}(OH)_{1.94}$;
59) $K_{0.789}Na_{0.255}Ca_{1.987}Mg_{1.753}Mn_{0.021}Fe^{2+}{}_{1.941}Fe^{3+}{}_{0.088}Ti_{0.381}Al_{0.783}(Si_{5.412}Al_{2.588})O_{22}(OH)_2$;
60) $(K_{0.62}Na_{0.37})Ca_2(Mg_{1.48}Mn_{0.06}Fe^{2+}{}_{1.94}Fe^{3+}{}_{0.39}Ti_{0.25}Al_{0.88})(Si_{5.24}Al_{2.76})O_{22}(OH)_2$;
61) $(K_{0.75}Na_{0.22})Ca_{2.07}(Mg_{1.84}Mn_{0.01}Fe^{2+}{}_{1.37}Fe^{3+}{}_{0.39}Ti_{0.38}Al_{0.94})(Si_{4.95}Al_{3.05})O_{22}(OH)_2$;
62) $(K_{0.41}Na_{0.53})Ca_{2.06}(Mg_{3.10}Fe^{2+}{}_{0.01}Fe^{3+}{}_{1.06}Mn_{0.01}Ti_{0.52}Al_{0.34})(Si_{5.87}Al_{2.13})O_{22}(OH,F)_2$;
63 $(K_{0.25}Na_{0.69})(Ca_{1.72}Na_{0.04})(Mg_{2.42}Mn_{0.02}Fe^{2+}{}_{0.61}Fe^{3+}{}_{1.04}Ti_{0.67}Al_{0.48})(Si_{5.75}Al_{2.25})O_{22}(OH)_2$;

Table 4 (cont.)

64) $Na_{0.03}Ca_{2.00}Mg_{4.92}Fe^{2+}{}_{0.04}Fe^{3+}{}_{0.02}Al_{0.05}Si_{7.81}Al_{0.19}O_{21.99}(OH)_{2.01}$;

65) $(K_{0.199}Na_{0.804})(Mg_{0.240}Ca_{1.675}Na_{0.085})(Al_{0.677}Ti_{0.428}Cr_{0.003}Mg_{3.892})(Si_{6.168}Al_{1.832})O_{22}(OH)_{1.356}F_{0.014}Cl_{0.008}O^{2-}{}_{0.622}$;

66) $(K_{0.215}Na_{0.807})(Na_{0.094}Ca_{1.789}Mg_{0.116})(Al_{0.471}Ti_{0.673}Mg_{3.856})(Si_{5.860}Al_{2.140})O_{22}(OH)_{1.378}F_{0.014}Cl_{0.003}O^{2-}{}_{0.605}$;

67) $(Ca_{1.787}\square_{0.207})(Na_{0.283}K_{0.128})(Al_{0.250}Ti_{0.154}Cr^{3+}{}_{0.001}Fe^{3+}{}_{0.133}Fe^{2+}{}_{1.536}Mn^{2+}{}_{0.021}Mg_{3.109}Zn_{0.004})(Si_{6.923}Al_{1.077})O_{22}$-$(OH)_{1.953}F_{0.047}$;

68) $(K_{0.10}Na_{0.27})(Na_{0.41}Ca_{1.59})(Mg_{3.73}Mn_{0.01}Fe^{2+}{}_{0.42}Fe^{3+}{}_{0.15}Ti_{0.03}Al_{0.62})(Si_{6.73}Al_{1.27})O_{22}(OH)_2$;

69) $(K_{0.041}Na_{0.658})(Na_{0.168}Ca_{1.762})(Mg_{3.317}Fe^{2+}{}_{0.800}Fe^{3+}{}_{0.288}Al_{0.665})(Si_{6.517}Al_{1.483})O_{22}(OH)_2$;

70) $(K_{0.022}Na_{0.134})(Na_{1.422}Ca_{1.422})(Mg_{2.676}Mn_{0.036}Fe^{2+}{}_{1.535}Fe^{3+}{}_{0.271}Ti_{0.086}Al_{0.840})(Si_{6.372}Al_{1.628})O_{22}(OH)_2$;

71) $(K_{0.40}Na_{0.60})(Na_{1.96}Ca_{0.04})(Mg_{2.02}Al_{0.22}Fe^{3+}{}_{1.26}Mn^{3+}{}_{0.76}Ti_{0.08}\square_{0.66})Si_8O_{22}(OH,F,O^{2-})_2$;

72) $NaNaCaMg_5Si_8O_{22}(OH)_2$;

73) $Na_{0.93}Na_{0.97}Ca_{1.02}Mg_{4.93}Si_{8.04}O_{22}F_{2.01}$;

74) $NaNaMg_6Si_8O_{22}(OH)_2$;

75) $Na_{1.97}Mg_{6.01}Si_{7.97}O_{22}F_{1.96}$;

76) $(Na_{0.736}K_{0.213})(Ca_{0.758}Na_{0.867}C_{0.375})(Al_{0.034}Ti_{0.001}Fe_{0.240}Mg_{4.30}Mn_{0.800})(Si_{7.880}Al_{0.120})O_{22}(OH)_{1.668}F_{0.332}$ with $C = Mn^{2+}$ or Fe^{2+};

77) $(Na_{0.699}K_{0.214})(Ca_{0.757}Na_{0.878}C_{0.365})(Al_{0.047}Ti_{0.001}Fe_{0.225}Mg_{0.274}Mn_{0.818})(Si_{7.918}Al_{0.082})O_{22}(OH)_{1.664}F_{0.336}$ with $C = Mn^{2+}$ or Fe^{2+};

78) $(Na_{0.704}K_{0.257})(Na_{0.801}Ca_{0.877}C_{0.322})(Al_{0.020}Ti_{0.001}Fe_{0.196}Mg_{4.340}Mn_{0.765})(Si_{7.816}Al_{0.184})O_{22}(OH)_{1.697}F_{0.303}$ with $C = Mn^{2+}$ or Fe^{2+};

79) $(Na_{0.542}K_{0.381})(Na_{0.924}Ca_{0.915}C_{0.161})(Al_{0.077}Ti_{0.003}Fe_{0.196}Mg_{3.932}Mn_{0.953})(Si_{7.997}Al_{0.003})O_{22}(OH)_{1.650}F_{0.350}$ with $C = Mn^{2+}$ or Fe^{2+};

80) $Na_2CaMg_5Si_8O_{22}(OH)_2$ synthetic;

81) $KNaCaFe_5Si_8O_{22}(OH)_2$ synthetic;

82) $KNaCaMg_5Si_8O_{22}(OH)_2$ synthetic;

83) $NaNaCaMg_5Si_8O_{22}(OH)_2$;

84) $KNaCaMg_5Si_8O_{22}(OH)_2$;

85) $K(KCa)Mg_5Si_8O_{22}(OH)_2$;

86) $(K_{0.9}Na_{0.1})(Ca_{0.52}Na_{1.48})(Fe^{2+}{}_{3.50}Fe^{3+}{}_{1.50})Si_{7.99}O_{22}(OH)_2$;

87) $Na(Na_{1.0}Ca_{1.0})Mg_5Si_8O_{22}F_2$;

88) $(K_{0.17}Na_{0.50})(Na_{1.73}Ca_{0.27})(Li_{0.16}Mg_{3.69}Mn^{3+}{}_{0.06}Fe^{3+}{}_{1.14})(Si_{7.90}Al_{0.10})O_{22}(OH)_2$;

89) $(Na_{0.607}K_{0.381})(Ca_{1.176}Na_{0.792}Mn^{2+}{}_{0.032})(Fe^{2+}{}_{2.429}Mg_{0.866}Mn^{2+}{}_{0.153}Fe^{3+}{}_{1.307}Ti_{0.186}Al_{0.039})(Si_{6.178}Al_{1.822})O_{22}$-$(OH)_{1.910}$;

90) $K_{1.03}(Ca_{1.05}Na_{1.00})(Mg_{4.49}Mn_{0.01}Fe^{2+}{}_{0.28}Ti_{0.17})(Si_{7.44}Al_{0.29})O_{22}F_{0.54}(OH)_{1.46}$;

91) $(Na_{1.84}Ca_{0.20})(Mg_{2.38}Fe^{2+}{}_{0.70}Fe^{3+}{}_{0.30}Al_{1.58}Ti_{0.06}Mn_{0.01})(Si_{7.92}Al_{0.08})(O^{2-},OH^{2-},F^-,Cl^-)_{24}$;

92) $(Ca_{0.199}Na_{1.833}K_{0.003})(Mn_{0.008}Mg_{2.368}Fe^{2+}{}_{0.695}Fe^{3+}{}_{0.295}Ti_{0.068}Al_{1.529})(Si_{7.880}Al_{0.120})O_{22}(OH)_2$;

93) $(Na_{1.75}Ca_{0.15})(Mg_{1.03}Mn_{0.01}Fe^{2+}{}_{1.94}Fe^{3+}{}_{0.31}Ti_{0.01}Al_{1.83})(Si_{7.94}Al_{0.06})O_{22}(OH)_2$;

94) $(Ca_{0.037}Na_{1.816})(Al_{0.022}Fe^{3+}{}_{2.149}Fe^{2+}{}_{2.492}Mg_{0.315})(Si_{7.985}Al_{0.015})O_{22}(OH)_2$;

95) $(Ca_{0.336}Na_{1.865}K_{0.026})(Mn_{0.009}Mg_{2.609}Fe^{2+}{}_{0.624}Fe^{3+}{}_{1.796}Ti_{0.009})(Si_{7.903}Al_{0.034})O_{22}(OH)_2$;

96) $(Na_{0.037}K_{0.290})(Ca_{0.013}Na_{1.987})(Li_{0.334}Mg_{0.011}Mn_{0.182}Fe^{2+}{}_{2.299}Fe^{3+}{}_{2.025}Ti_{0.016}Al_{0.103})(Si_{7.748}Al_{0.252})O_{22}F_{1.253}(OH)_{0.892}$;

97) $(Na_{0.29}K_{0.71})(Na_{1.84}Ca_{0.16}Fe^{2+}{}_{3.60}Mg_{0.11}Mn_{0.13}Fe^{3+}{}_{0.92}Ti_{0.09}Al_{0.15})(Si_{7.83}Al_{0.17})O_{22}(OH,F,O)_2$;

98) $(Na_{0.48}K_{0.33})(Na_{1.81}Ca_{0.19})(Fe^{3+}{}_{1.42}Fe^{2+}{}_{3.27}Ti_{0.06}Mg_{0.01}Mn_{0.09}Ca_{0.15})(Si_{7.49}Al_{0.46}Fe^{3+}{}_{0.05})O_{22}F_{0.19}(OH,O)_{1.81}$;

99) $(K_{0.31}Na_{0.08})(Na_{1.72}Ca_{0.28})(Mg_{3.51}Mn^{3+}{}_{0.48}Fe^{3+}{}_{0.87}Ti_{0.10})(Si_{7.90}Al_{0.09})O_{22}(OH)_2$;

100) has been deleted

101) $(Na_{0.44}K_{0.29})(Na_{1.57}Ca_{0.43})(Mg_{4.14}Mn_{0.03}Fe^{2+}{}_{0.09}Fe^{3+}{}_{0.60}Ti_{0.05}Al_{0.09})(Si_{7.85}Al_{0.15})O_{22}F_{1.22}(OH)_{0.78}$;

102) $(K_{0.18}Na_{0.84})(Na_{1.86}Ca_{0.08}Fe^{2+}{}_{0.06})Mg_{3.09}Zn_{0.01}Li_{0.03}Fe^{3+}{}_{0.29}Mn^{3+}{}_{0.37}Fe^{2+}{}_{0.41}Ti^{4+}{}_{0.86}Al_{0.03})Si_{8.00}O_{22}(OH)_{0.20}$-$F_{0.26}O_{1.54}$;

103) $(Na_{2.54}K_{0.27}Ca_{0.19})(Mn_{3.69}Mg_{0.63}Fe^{3+}{}_{0.33}Al_{0.31})Si_{8.0}O_{21.78}(OH)_{2.18}F_{0.04}$;

104) $(Na_{0.72}K_{0.02})(Na_{1.67}Ca_{0.33})(Mg_{1.82}Fe^{2+}{}_{0.18})(Mg_{0.32}Fe^{3+}{}_{0.24}Ti_{0.02}Al_{1.43})(Mg_{0.8}Fe^{2+}{}_{0.2})(Si_{7.24}Al_{0.76})O_{22}(OH)_2$;

105) $(Na_{0.78}K_{0.06})(Na_{1.53}Ca_{0.47})(Mg_{2.55}Fe^{2+}{}_{0.89}Mn_{0.01}Zn_{0.01}Fe^{3+}{}_{0.32}Al_{1.21}Ti_{0.01})(Si_{7.14}Al_{0.86})O_{22}F_{1.16}(OH)_{0.84}$;

106) $(K_{0.20}Na_{0.75})(Na_{1.92}Ca_{0.08})(Mg_{2.32}Fe^{3+}{}_{1.31}Mn^{3+}{}_{0.42}Al_{0.14}Li_{0.81})(Si_{7.93}Al_{0.07})O_{22}(OH)_{1.49}F_{0.51}$;

107) $(Na_{0.52}K_{0.04})(Na_{0.25}Ca_{0.05}Li_{1.70})(Li_{0.64}Fe^{3+}{}_{1.64}Mg_{1.49}Fe^{2+}{}_{0.85}Al_{0.21}Ti_{0.09}Mn_{0.07}Zn_{0.01})Si_8O_{22}F_{0.69}(OH)_{1.31}$;

Table 4 (cont.)

108) $(Na_{0.70}K_{0.03})(Li_{1.34}Na_{0.58}Ca_{0.08})(Mg_{1.75}Fe^{3+}{}_{1.65}Li_{0.88}Fe^{2+}{}_{0.32}Al_{0.21}Ti_{0.11}Mn^{2+}{}_{0.07}Zn_{0.01})Si_8O_{22}(OH)_{1.35}F_{0.65}$;
109) $^{A}(Na_{0.64}K_{0.01})^{B}(Li_{1.93}Ca_{0.04}Na_{0.03})^{M1}(Mg_{1.69}Fe^{2+}{}_{0.31})^{M2}(Al_{1.98}Cr_{0.01}Zn_{0.01})^{M3}(Li_{0.64}Fe^{2+}{}_{0.21}Mg_{0.13}Mn_{0.02})$-$^{T1}(Si_{3.96}Al_{0.04})^{T2}Si_4O_{22}{}^{x}(F_{1.10}OH_{0.90})$;
110) $(K_{0.15}Na_{0.82})(Na_{1.97}Ca_{0.03})(Mn^{2+}{}_{1.66}Mg_{0.34}Mn^{3+}{}_{2.96}Fe^{3+}{}_{0.06}Zn_{0.01})(Si_{7.99}Al_{0.01})O_{22}O_2$;
111) $^{A}(K_{0.07}Na_{0.38})^{B}(Na_{0.70}Li_{1.24}Ca_{0.06})^{C}(Mg_{1.35}Fe^{2+}{}_{0.92}Mn^{2+}{}_{0.13}Zn_{0.31}Fe^{3+}{}_{1.71}Al_{0.10}Ti_{0.06}Li_{0.42})Si_8O_{22}(OH_{1.51}F_{0.47})$;
112) $^{A}(K_{0.13}Na_{0.64})^{B}(Na_{1.27}Li_{0.62}Ca_{0.11})^{C}(Mg_{1.47}Fe^{2+}{}_{0.58}Mn^{2+}{}_{0.12}Zn_{0.40}Fe^{3+}{}_{1.48}Al_{0.10}Ti_{0.12}Li_{0.73})Si_8O_{22}(OH_{1.30}F_{0.72})$;
113) $(K_{0.40}Na_{0.61})(Na_{1.71}Ca_{0.29})(Mg_{1.81}Zn_{0.01}Ni_{0.02}Li_{0.90}Fe^{3+}{}_{0.71}Mn^{3+}{}_{0.85}Ti^{4+}{}_{0.60}Al_{0.10})(Si_{7.96}Al_{0.04})O_{22}(OH_{0.80}O_{1.20})$.

Table 5. Elastic properties

a) Bulk modulus

Silicate	*K* [GPa]	*K*'	Refs.
Grunerite[1)]	50(1)	13(1)	92Z2
Tremolite[2)]	85		91C1
Pargasite[4)]	97		91C1
Glaucophane[3)]	96		91C1
Cummingtonite[5)] $P2_1/m$	71(1)	6.1(5)	98Y1
Cummingtonite[5)] C2/m	78(3)	4.0	98Y1

b) Compressibility coefficients

Silicate	$\beta_i \cdot 10^3$ [GPa^{-1}]			Refs.
	β_a	β_b	β_c	
Grunerite[1)]	4.97(6)	3.50(4)	3.62(5)	92Z2
Tremolite[2)]	5.9	2.7	2.6	91C1
Glaucophane[3)]	5.3	2.4	2.3	91C1
Pargasite[4)]	4.6	2.8	2.4	91C1
Cummingtonite[5)] C2/m	6.8(2)	2.4(3)	2.8(1)	98Y1
Cummingtonite[5)] $P2_1/m$	4.3(3)	2.9(1)	3.0(1)	98Y1

1) $(Na_{0.05}K_{0.01}Fe^{2+}{}_{5.33}Mg_{1.46}Fe^{3+}{}_{0.14}Al_{0.01})(Si_{7.92}Al_{0.08})O_{22}(OH)_{1.92}F_{0.05}Cl_{0.01}$;
2) $Ca_2(Mg_{4.95}Fe^{2+}{}_{0.05})Si_8O_{22}(OH)_2$;
3) $Na_{1.98}Li_{0.02}(Mg_{1.98}Fe^{2+}{}_{1.02}Fe^{3+}{}_{0.40}Al_{1.60})Si_8O_{22}(OH)_2$;
4) $K_{0.02}Na_{0.74}Ca_{1.98}Fe^{2+}{}_{0.02}(Mg_{4.26}Fe^{2+}{}_{0.19}Cr_{0.18}Ti_{0.07}Al_{0.30})(Si_{6.62}Al_{1.38})O_{22}(OH)_2$;
5) $Ca_{0.076}Mg_{3.445}Fe_{3.272}Mn_{0.199}Al_{0.008}(Si_{7.983}Al_{0.017})O_{22}(OH)_2$.

Table 6. Magnetic properties of amphiboles

Silicate	$T_N(T_{SC})$[1)] [K]	Θ [K]	Curie constant *C*	Magnetic moment p_{Fe} [μ_B]	$\mu_o H_c$ [T]	$\mu_o H_A$ [T]	$\mu_o H_s$ [T]	Refs.
$(Fe_xMg_{1-x})_7Si_8O_{22}OH_2$ cummingtonite								88L1
x = 0.95	T_N=47(1)[2)]							
x = 0.49	T_N=6.5(10)[2)]							
x = 0.36	T_N=3.5(5)[2)]							
x = 0.95	T_N=44.0(5) T_{SC}=6.0(5)	47(1)	3.9 K emu/ g-atom Fe	4.1 (at 4.2 K)	1.4		0.5	88L1

Table 6 (cont.)

Silicate	$T_N(T_{SC})$[1)] [K]	Θ [K]	Curie constant C	Magnetic moment p_{Fe} [μ_B]	$\mu_o H_c$ [T]	$\mu_o H_A$ [T]	$\mu_o H_s$ [T]	Refs.
Anthophyllite (amosite) (composition not mentioned)	T_N=25 K T_{sp}=10 K							75E1
Grunerite[3)]	T_N=47 T_{SC}=7	67			1.2			87G1
Riebeckite[4)]	T_N= 31.5	22.4	p_{eff}=5.8 μ_B/Fe atom $C=2.26\cdot10^{-2}$ K emu/g	4.1 (at 5 K)				75B3
Riebeckite[5)]	T_N=33(1) [2)]							96V1
Riebeckite[6)]	T_N=31(1) [2)]							96V1
Riebeckite[7)] (crocidolite)	T_N=30(1)							83M3
Riebeckite[8)] (crocidolite)	T_N=30(1)	26.5(1.0)	C=0.01228 K emu/g			$H_{A\parallel}$=20 $H_{A\perp}$=0.42	1.5	83M3, 82C1
Arfvedsonite[9)]	T_N=27	30						74B1, 80B1

1) T_N – Néel temperature. T_{SC} – spin canting temperature, Θ – paramagnetic Curie temperature, H_c – critical field for metamagnetic transition; H_A – anisotropy field, H_s – spin flopping field;
2) Values determined by ^{57}Fe NGR method;
3) $(Ca_{0.110}Mn_{0.142}Fe^{2+}_{6.685}Mg_{0.096})(Si_{7.968}Al_{0.016})O_{22}(OH)_2$;
4) $Na_2Fe_5Si_8O_{22}(OH,F)_2$;
5) $Na_{0.47}K_{0.45}Fe^{2+}_{2.81}Fe^{3+}_{2.21}Mn_{0.22}Zn_{0.23}Ti_{0.18}Si_{7.80}O_{22}(OH)_2$;
6) $Na_{1.86}Fe^{2+}_{2.65}Fe^{3+}_{2.25}Mg_{0.60}Si_{7.72}O_{22}(OH)_2$;
7) $(Na_{1.8}Ca_{0.2})(Fe^{2+}_{1.17}Mg_{0.3}; Fe^{3+}_{1.7}Al_{0.1}M_{0.1}; Fe^{2+}_{0.9}Mg_{0.1})Si_8O_{22}(OH)_2$, M-other cations mainly Ti and Mn;
8) $Na_2(Fe^{2+}_{1.0}Mg_{1.0}; Fe^{3+}_{1.5}Al_{0.5}; Fe^{2+}_{0.7}Mg_{0.3})Si_8O_{22}(OH)_2$;
9) $NaNa_2Fe^{2+}_4Fe^{3+}Si_8O_{22}(OH)_2$.

Table 7. Data obtained by neutron diffraction studies

Silicate	T [K]	Magnetic moments	Refs.
Grunerite[1)]	4.5	Total magnetic moment p, and the perpendicular component, $p_\perp$, to ***b***-axis p(M1)=4.4(6) μ_B; $p_\perp$(M1)=2.1(2) μ_B; p(M2)=3.6(5) μ_B; $p_\perp$(M2)=-0.4(2) μ_B; p(M3)=3.7(7) μ_B; p(M4)=3.2(3) μ_B; $p_\perp$(M4)=1.1(2) μ_B;	87G1
	12	Total magnetic moment parallel to ***b*** p(M1)=4.0(7) μ_B; p(M2)=3.0(8) μ_B; p(M3)=5.0(6) μ_B; p(M4)=2.4(4) μ_B;	
	42	p(M1)=2.7(5) μ_B; p(M2)=2.1(8) μ_B; p(M3)=3.6(6) μ_B; p(M4)=1.6(4) μ_B;	
Riebeckite[2)]	5	Iron ions in the ribbons parallel to ***c*** are coupled ferromagnetically but the moments of adjacent ribbons are oppositely aligned. p_{Fe} are oriented at angles 69°, 36°, 69° with ***a***,***b***, ***c***-axes respectively	83M3

(Footnotes see next page)

Table 7.(cont.)

1) $Ca_{0.110}Mn_{0.142}Fe^{2+}_{6.685}Mg_{0.096}(Si_{7.968}Al_{0.016})O_{22}(OH)_2$;
2) $(Na_{1.8}Ca_{0.2})(Fe^{2+}_{1.17}Mg_{0.3};Fe^{3+}_{1.7}Al_{0.1}M_{0.1};Fe^{2+}_{0.9}Mg_{0.1})Si_8O_{22}(OH)_2$ where M represent other cations mainly Ti and Mn.

Table 8. Data obtained by ^{57}Fe NGR method.

Silicate	*T* [K]	Site	*δ*[1] [mm/s]	Δ*Q* [mm/s]	B_{hf} [T]	*DH* [mm/s]	*A* [%]	Refs.
Ferri-clinoholmquistite[2]	RT	M1(Fe^{2+})	1.130(6)	2.814(18)		0.296(18)	19	04I2
		M3(Fe^{2+})	1.110(13)	2.525(40)		0.306(38)	10	
		M4(Fe^{2+})	1.11(48)	1.74(95)		0.398(22)	21	
		M2(Fe^{3+})	0.37(19)	0.26(38)		0.390(18)	50	
Ferri-clinoholmquistite – riebeckite[3]	RT	M1(Fe^{2+})	1.15(1)	2.82(1)		0.32(1)	38	03I2
		M3(Fe^{2+})	1.08(1)	2.43(1)		0.45(1)	20	
		M2(Fe^{3+})	0.39(1)	0.34(1)		0.37(1)	38	
		M4(Fe^{2+})	1.10(1)	1.80(1)		0.37(1)	4	
Grunerite[4] x = 1.0	4.2	M1	1.29(2)	–3.19(3)	18.1(5)			83L1
		M2	1.27(2)	–2.96(2)	15.3(5)			
		M3	1.29(2)	–3.19(3)	21.7(5)			
		M4	1.19(2)	1.52(3)	8.7(5)			
	77	M1,M3	1.29(2)	3.19				
		M2	1.27(2)	2.96				
		M4	1.19(2)	1.54				
Grunerite[4] x = 0.95	14	M1	1.28(2)	3.20(2)	6.3(5)			88L1
		M2	1.28(2)	2.96(2))	11.4(5)			
		M3	1.28(2)	3.20(2	15.3(5)			
		M4	1.17(2)	1.52(2)	24.5(5)			
	77	M1,M3	1.27(2)	3.20(2)				
		M2	1.26(2)	2.96(2)				
		M4	1.17(2)	1.51(2)				
	77	M1,M2,M3	1.27(2)	3.10(2)				
		M4	1.17(2)	1.51(2)				
	300	M1,M2,M3	1.16(2)	2.78(2)				
		M4	1.06(2)	1.51(2)				
Grunerite[5] *p* = 0	293	M1,M2,M3	1.159	2.794		0.26	61.6	92Z1
		M4	1.079	1.579		0.28	38.4	
p = 4.6 GPa		M1,M2,M3	1.139	2.762		0.26	62.4	
		M4	1.094	1.744		0.28	37.6	
p = 8.5 GPa		M1,M2,M3	1.114	2.714		0.34	60.7	
		M4	1.107	1.912		0.33	39.3	
Cummingtonite[4] x = 0.49	77	M1,M2,M3	1.25(2)	3.10(2)				88L1
		M4	1.23(2)	1.71(2)				
	300	M1,M2,M3	1.14(2)	2.80(2)				
		M4	1.08(2)	1.64(2)				
Cummingtonite[4] x = 0.36	77	M1,M2,M3	1.25(2)	3.10(2)				88L1
		M4	1.23(2)	1.77(2)				
	300	M1,M2,M3	1.14(2)	2.80(2)				
		M4	1.09(2)	1.66(2)				

Table 8 (cont.)

Silicate	T [K]	Site	$\delta^{1)}$ [mm/s]	ΔQ [mm/s]	B_{hf} [T]	DH [mm/s]	A [%]	Refs.
Actinolite[6)]	RT	M1(Fe^{2+})	1.14	2.89		0.26	0.27[7)]	71B2
		M3(Fe^{2+})	1.12	2.57		0.26	0.14[7)]	
		M2(Fe^{2+})	1.14	1.91		0.26	0.07[7)]	
		Fe^{3+}	0.28	0.53		0.68	0.236[7)]	
Actinolite[8)]	RT	M1(Fe^{2+})	1.11	2.71		0.32	0.72[7)]	71B2
		M3(Fe^{2+})	1.07	2.30		0.32	0.38[7)]	
		M2(Fe^{2+})	1.10	1.72		0.32	0.26[7)]	
		Fe^{3+}	0.38	0.65		0.41	0.246[7)]	
Actinolite[9)]	RT	M1(Fe^{2+})	1.13	2.86		0.28	1.48[7)]	71B2
		M3(Fe^{2+})	1.14	2.19		0.28	0.46[7)]	
		M2(Fe^{2+})	1.12	1.77		0.28	0.46[7)]	
Actinolite[10)]	RT	M1(Fe^{2+})	1.11	2.81		0.29	1.68[7)]	71B2
		M3(Fe^{2+})	1.12	2.13		0.29	0.56[7)]	
		M2(Fe^{2+})	1.11	1.73		0.29	0.62[7)]	
Hastingsite[11)]	RT	M1(Fe^{2+})	1.13(3)	2.73(3)		0.31(3)	47.9	82T1
		M3(Fe^{2+})	1.12(3)	2.37(3)		0.31(3)	26.9	
		M2(Fe^{2+})	1.09(3)	1.92(3)		0.31(3)	12.9	
		M2(Fe^{3+})	0.49(3)	0.50(3)		0.46(3)	12.4	
Hastingsite[12)]	RT	M1(Fe^{2+})	1.13(3)	2.74(3)		0.31(3)	38.7	82T1
		M3(Fe^{2+})	1.11(3)	2.36(3)		0.31(3)	24	
		M2(Fe^{2+})	1.09(3)	1.82(3)		0.31(3)	11	
		M2(Fe^{3+})	0.38(3)	0.69(3)		0.38(3)	26.3	
Hastingsite[13)]	RT	M1(Fe^{2+})	1.12(3)	2.72(3)		0.32(3)	42.5	82T1
		M3(Fe^{2+})	1.09(3)	2.31(3)		0.32(3)	25.7	
		M2(Fe^{2+})	1.12(3)	1.72(3)		0.32(3)	12.4	
		M2(Fe^{3+})	0.40(3)	0.70(3)		0.38(3)	19.4	
Hastingsite[14)]	RT	M1(Fe^{2+})	1.16(3)	2.72(3)		0.32(3)	36.4	82T1
		M3(Fe^{2+})	1.12(3)	2.35(3)		0.32(3)	23.1	
		M2(Fe^{2+})	1.12(3)	1.81(3)		0.32(3)	11.0	
		M2(Fe^{3+})	0.41(3)	0.72(3)		0.42(3)	29.5	
Magnesiohastingsite[15)]	RT	Fe^{2+}	1.13	2.54			Fe^{2+}/Fe^{3+} =1.80	90H1
		Fe^{2+}	1.16	1.91				
		Fe^{3+}	0.49	0.98				
		Fe^{3+}	0.37	0.69				
Kaersutite[16)]	RT	Fe^{2+}	1.13	2.43			Fe^{2+}/Fe^{3+} =1.71	90H1
		Fe^{2+}	1.14	1.87				
		Fe^{3+}	0.39	1.17				
		Fe^{3+}	0.38	0.69				
Potassic ferri-ferrorichterite[17)]	80	M1(Fe^{2+})	1.26(1)	3.13(4)			37.0(9)	02R2
		M3(Fe^{2+})	1.27(1)	2.80(4)			17.2(9)	
		M2(Fe^{2+})	1.27(1)	2.56(8)			15.3(9)	
		M4(Fe^{2+})	1.15(6)	1.64(9)			2.3(6)	
		M2(Fe^{3+})	0.51(2)	0.46(3)			22.6(8)	
		M3(Fe^{3+})	0.51(2)	0.5(1)			2.8(8)	
		M1(Fe^{3+})	0.51(2)	0.99(4)			2.8(8)	

Table 8 (cont.)

Silicate	T [K]	Site	δ[1)] [mm/s]	ΔQ [mm/s]	B_{hf} [T]	DH [mm/s]	A [%]	Refs.
Potassic ferri-ferrorichterite[17)] (cont.)	298	M1(Fe^{2+})	1.15(2)	2.79(3)			36.9(9)	02R2
		M3(Fe^{2+})	1.16(2)	2.37(3)			16.4(9)	
		M2(Fe^{2+})	1.17(2)	1.93(9)			15.5(9)	
		M4(Fe^{2+})	1.134(4)	1.43(5)			2.3(9)	
		M2(Fe^{3+})	0.42(2)	0.45(2)			23.9(7)	
		M3(Fe^{3+})	0.42(2)	1.17(5)			2.0(7)	
		M1(Fe^{3+})	0.43(2)	1.70(4)			3.0(7)	
Pargasite[18)]	RT	Fe^{2+}	1.19	2.37			Fe^{2+}/Fe^{3+} =1.78	90H1
		Fe^{2+}	1.18	1.88				
		Fe^{3+}	0.71	1.07				
		Fe^{3+}	0.32	0.91				
Hornblende[19)]	RT	M1(Fe^{2+})	1.40[20)]	2.81		0.33	Fe^{2+}/Fe^{3+} =0.223	75B1
		M3(Fe^{2+})	1.37[20)]	2.39		0.33		
		M2(Fe^{2+})	1.31[20)]	1.99		0.33		
		M1,M2,M3(Fe^{3+})	0.75[20)]	0.53		0.38		
Winchite[21)]	RT	Fe^{3+}	0.393(3)	0.487(3)		0.50	100	86G1
Glaucophane[22)]	RT	M1(Fe^{2+})	1.13	2.81		0.25	45.3	70E1
		M3(Fe^{2+})	1.10	2.30		0.25	31.5	
		M2(Fe^{3+})	0.34	0.48		0.25	23.2	
Riebeckite[23)]	RT	M1(Fe^{2+})	1.14(1)	2.85(1)		0.33(1)	41	03I2
		M3(Fe^{2+})	1.10(1)	2.40(1)		0.30(1)	15	
		M2(Fe^{3+})	0.44(1)	0.39(1)		0.37(1)	40	
		M4(Fe^{3+})	1.80(1)	1.10(1)		0.32(1)	4	
Magnesioriebeckite[24)]	RT	M1(Fe^{2+})	1.14	2.87		0.26	36.4	70E1
		M3(Fe^{2+})	1.12	2.36		0.26	19.0	
		M2(Fe^{3+})	0.40	0.44		0.26	44.6	
Magnesioriebeckite[25)]	RT	M1(Fe^{2+})	1.14	2.79		0.29	22.4	70E1
		M3(Fe^{2+})	1.12	2.48		0.29	9.2	
		M2(Fe^{3+})	0.39	0.44		0.29	68.6	
F riebeckite[26)]	RT	M1(Fe^{2+})	1.16(1)	2.93(1)		0.29[27)]	33	88B1
		M3(Fe^{2+})	1.13(1)	2.61(1)		0.29[27)]	17	
		M2(Fe^{2+})	0.93(1)	2.19(1)		0.29[27)]	4.5	
		M2(Fe^{3+})	0.40(1)	0.49(1)		0.29	37	
		M1(Fe^{3+})	0.09(1)	0.17(1)		0.36	8.5	
Riebeckite[28)]	4.2	Fe^{3+}	0.51[30)]		54.7[30)]		40	96V1
		Fe^{2+} [31)]	1.29	3.11	16.1[30)]		60	
	80	D1	1.275	3.15			75	
		D2		2.14			4	
		D3		2.80			18	
		D4		1.85			3	
Riebeckite[29)]	4.2	Fe^{3+}	0.50		54.9[30)]		46	96V1
		M1(Fe^{2+})[32)]	1.24	3.10	18.9[30)]		32	
		M3(Fe^{2+})[32)]	1.24	2.67	9.8[30)]		22	
	80	D1	1.244	3.10			62	
		D3		2.68			35	
		D4		1.89			3	

Table 8 (cont.)

Silicate	T [K]	Site	δ[1)] [mm/s]	ΔQ [mm/s]	B_{hf} [T]	DH [mm/s]	A [%]	Refs.
Riebeckite[33,34)]	4.2	M1(Fe^{2+})	1.29	–2.481	20.5	0.576	29.9	83M3
(Crocidolite)		M2(Fe^{3+})	0.517	0.169	55.0	0.338	30.4	
		M3(Fe^{2+})	1.286	–2.869	9.7	0.240	22.8	
		Fe^{3+} impurity	0.389	0.080	50.7	0.920	16.8	
	60	M1(Fe^{2+})	1.261	2.771		0.516	35.9	
		M2(Fe^{3+})	0.522	0.425		0.394	33.2	
		M3(Fe^{2+})	1.281	3.119		0.296	15.5	
		Fe^{3+} impurity	0.485	–0.084	50.6	0.674	15.4	
Crocidolite[35,36)]	4.2	M1(Fe^{2+})	1.314	–2.771	19.6	0.220	31.7	83M3
		M2(Fe^{3+})	0.511	0.197	54.7	0.430	45.6	
		M3(Fe^{2+})	1.314	–2.952	10.1	0.382	22.7	
Arfvedsonite[37)]	294	Fe^{3+}	0.38	0.56		0.34		96S1
		Fe_1^{2+}	1.10	2.82		0.31	0.68[38)]	
		Fe_2^{2+}	1.13	2.50		0.32	0.21[38)]	
		Fe_3^{2+}	1.10	1.92		0.32	0.11[38)]	
Magnesio-arfvedsonite[39)]	RT	A(M2)	0.377(3)	0.493(3)			97.7	86G1
		B	0.33(4)	1.98(4)			2.3	

1) relative to α-Fe;
2) $^{A}Li_{0.19}{}^{B}(Li_{1.26}Fe^{2+}_{0.45}Mg_{0.29})(Mg_{3.31}Fe^{2+}_{0.62}Fe^{3+}_{1.07})Si_8O_{22}(OH)_2$;
3) $\square Li_2Fe^{2+}_3Fe^{3+}_2Si_8O_{22}(OH)_2$;
4) $(Fe_xMg_{1-x})_7Si_8O_{22}(OH)_2$. For sample with x = 0.95 at T = 14 K, values η = 0.2(1), 0.2(1), 0.4(1) and 0.1(1) and θ = 82(10)°, 27(10)°, 38(10)° and 67(10)° were obtained for M1. M3, M2 and M4 sites, respectively;
5) $Na_{0.05}K_{0.01}Fe^{2+}_{5.33}Mg_{1.46}Fe^{3+}_{0.14}Al_{0.01}(Si_{7.92}Al_{0.08})O_{22}(OH)_{1.92}F_{0.05}Cl_{0.01}$;
6) $K_{0.02}Na_{0.30}Ca_{1.67}Mn_{0.01}Mg_{4.18}Fe^{2+}_{0.48}Fe^{3+}_{0.15}Ti_{0.02}Al_{0.23}(Al_{0.15}Si_{7.85})$, on the basis of 23O;
7) in atom pfu for Fe^{2+} and Fe^{3+}/total iron;
8) $K_{0.02}Na_{0.52}Ca_{1.58}Mn_{0.03}Mg_{2.60}Fe^{2+}_{1.35}Fe^{3+}_{0.36}Ti_{0.07}Al_{0.86}(Al_{1.67}Si_{6.33})$, on the basis of 23O;
9) $K_{0.01}Na_{0.07}Ca_{1.57}Mn_{0.04}Mg_{2.40}Fe^{2+}_{2.40}Fe^{3+}_{0.20}Ti_{0.01}Al_{0.10}Si_{8.05}$, on the basis of 23O;
10) $K_{0.01}Na_{0.05}Ca_{1.83}Mn_{0.03}Mg_{2.38}Fe^{2+}_{2.86}Ti_{0.01}Al_{0.03}Si_{7.93}$, on the basis of 23O;
11) $NaCa_2Fe^{2+}_4Fe^{3+}Si_6Al_2O_{22}(OH)_2$ - synthetic;
12) $K_{0.45}Na_{1.01}Ca_{1.56}Mg_{0.52}Mn_{0.09}Fe^{2+}_{2.71}Fe^{3+}_{0.94}Ti_{0.12}Al_{0.53}(Al_{2.07}Si_{5.93})O_{22}(OH)_2$;
13) $K_{0.38}Na_{0.47}Ca_{1.86}Mg_{0.17}Mn_{0.11}Fe^{2+}_{3.48}Fe^{3+}_{0.82}Ti_{0.06}Al_{0.35}(Al_{1.78}Si_{6.22})O_{22}(OH)_2$;
14) $K_{0.44}Na_{0.32}Ca_{1.86}Mg_{0.86}Mn_{0.04}Fe^{2+}_{2.62}Fe^{3+}_{1.20}Ti_{0.06}Al_{0.29}(Al_{1.86}Si_{6.14})O_{22}(OH)_2$;
15) $(K_{0.41}Na_{0.49})(Na_{0.19}Ca_{1.81})(Fe^{2+}_{0.90}Mg_{2.83}Ti_{0.51}Fe^{3+}_{0.50}Al_{0.23})(Si_{6.03}Al_{1.97})O_{22}(OH)_2$;
16) $(K_{0.44}Na_{0.51})(Na_{0.05}Ca_{1.83}Fe^{2+}_{0.12})(Fe^{2+}_{0.41}Mg_{3.56}Ti_{0.51}Fe^{3+}_{0.31}Al_{0.21})(Si_{5.87}Al_{2.13})O_{22}(OH)_2$;
17) $(K_{0.9}Na_{0.1})(Ca_{0.52}Na_{1.48})(Fe^{2+}_{3.50}Fe^{3+}_{1.50})Si_{7.99}O_{22}(OH)_2$;
18) $(K_{0.25}Na_{0.63})(Na_{0.18}Ca_{1.82})Fe^{2+}_{0.03}Mg_{0.85}Ti_{2.58}Fe^{3+}_{0.43}Al_{1.09}Si_8O_{22}(OH)_2$;
19) Composition not mentioned;
20) Relative to sodium nitroprusside;
21) $(K_{0.17}Na_{0.50})(Na_{1.73}Ca_{0.27})(Li_{0.16}Mg_{3.69}Mn^{3+}_{0.06}Fe^{3+}_{1.14})(Si_{7.90}Al_{0.10})O_{22}(OH)_2$;
22) $(Ca_{0.199}Na_{1.833}K_{0.003})(Mn_{0.008}Mg_{2.368}Fe^{2+}_{0.695}Fe^{3+}_{0.295}Ti_{0.068}Al_{1.529})(Si_{7.880}Al_{0.120})O_{22}(OH)_2$;
23) $\square Na_2Fe^{2+}_3Fe^{3+}_2Si_8O_{22}(OH)_2$;
24) $(Ca_{0.037}Na_{1.816})(Al_{0.022}Fe^{3+}_{2.149}Fe^{2+}_{2.492}Mg_{0.315})(Si_{7.985}Al_{0.015})O_{22}(OH)_2$;
25) $(Ca_{0.336}Na_{1.865}K_{0.026})(Mn_{0.009}Mg_{2.609}Fe^{2+}_{0.624}Fe^{3+}_{1.796}Ti_{0.009})(Si_{7.903}Al_{0.034})O_{22}(OH)_2$;
26) No composition was given;
27) The linewidths were constrained to be equal;
28) $Na_{0.47}K_{0.45}Fe^{2+}_{2.81}Fe^{3+}_{2.21}Mn_{0.22}Zn_{0.23}Ti_{0.18}Si_{7.80}O_{22}(OH)_2$;

Table 8 (cont.)

29) $Na_{1.86}Fe^{2+}_{2.65}Fe^{3+}_{2.25}Mg_{0.60}Si_{7.72}O_{22}(OH)_2$;

30) The most probably hyperfine field in the respective distributions and ΔQ an δ_m are the correspondingly quadrupole splittings and isomer shifts;

31) The asymmetry parameter of EFG for Fe^{2+} doublet $\eta = 0.28$ and the angle θ between the hyperfine field and EFG is 74°;

32) Values $\eta^m = 0.14$ and $\theta = 84°$ were obtained for M1(Fe^{2+}) and $\eta = 0$ and $\theta = 87°$ for M3(Fe^{2+});

33) $(Na_{1.8}Ca_{0.2})(Fe^{2+}_{1.17}Mg_{0.3}; Fe^{3+}_{1.7}Al_{0.1}M_{0.1}; Fe^{2+}_{0.9}Mg_{0.1})Si_8O_{22}(OH)_2$;

34) Values $\eta = 0.038$, $\theta = 90°$ for M1(Fe^{2+}) and $\eta = 0.293$, $\theta = 90°$ for M3(Fe^{2+}) were obtained at 4.2 K;

35) $Na_2(Fe^{2+}_{1.0}Mg_{1.0}; Fe^{3+}_{1.5}Al_{0.5}; Fe^{2+}_{0.7}Mg_{0.3})Si_8O_{22}(OH)_2$;

36) Values $\eta = 0.114$, $\theta = 90°$ for M1(Fe^{2+}) and $\eta = 0.324$ and θ=90°, for M3(Fe^{2+}) were obtained at 4.2 K;

37) $(Na_{0.48}K_{0.33})(Na_{1.81}Ca_{0.19})(Fe^{3+}_{1.42}Fe^{2+}_{3.27}Ti_{0.06}Mg_{0.01}Mn_{0.09}Ca_{0.15})(Si_{7.49}Al_{0.46}Fe^{3+}_{0.05})O_{22}(OH,O)_{1.81}F_{0.19}$;

38) $Fe^{2+}/\Sigma Fe^{2+}$;

39) $(K_{0.31}Na_{0.08})(Na_{1.72}Ca_{0.28})(Mg_{3.51}Mn_{0.48}Fe^{3+}_{0.87}Ti_{0.10})(Si_{7.90}Al_{0.09})O_{22}(OH)_2$;

40) $(K_{0.90}Na_{0.06})(Ca_{0.58}Na_{1.36}Fe^{2+}_{0.06})(Fe^{2+}_{3.48}Fe^{3+}_{1.52})Si_{7.99}O_{22}(OH)_2$.

Table 9. Data obtained by MAS NMR spectroscopy[a)].

Silicate	*T* [K]	Sites	Chem. shift δ [ppm]	Linewidth [Hz]	*A* [%]	Refs.
^{29}Si						
Sodium magnesiocummingtonite	RT	Q^3	–90;–87.9			92W1
		Q^2	–85.3;–84.1			
Tremolite	RT	Si_3	–91			83S1
		Si_2	–88			
Tremolite	RT	Si_3	–90.2			87R2
		Si_2	–87.2			
Tremolite	RT	Q^3	–91.7	203	51	98W1
		Q^2	–87.3	244	49	
Tremolite	RT	T1(Si_3)	–92.4		46	99S2
$Ca_2Mg_5Si_8O_{22}F_2$		T2(Si_2)	–87.8		54	
Tremolite	RT		–92.2			85J1
			–87.8			
$NaCa_2Mg_4ScSi_6Al_2O_{22}F_2$	RT		–90.5			87R2
(fluor scandium pargasite)			–87.7			
			–85.6			
			–83.3			
			–81.1			
			–78.3			
Tremolite[1)]	RT		–87.5	143	48[2)]	97J1
			–92	169	48	
Aluminous tremolite[3)]	RT		–87.7	210	47[2)]	97J1
			–92.3	236	48	
Aluminous tremolite[4)]	RT		–87.7	241	44[2)]	97J1
			–92.5	303	47	

Table 9 (cont.)

Silicate	*T* [K]	Sites	Chem. shift δ [ppm]	Linewidth [Hz]	*A* [%]	Refs.
Aluminous tremolite[5)]	RT		–87.6	259	42[2)]	97J1
			–92.5	349	49	
Aluminous tremolite[6)]	RT		–87.6	252	41[2)]	97J1
			–92.3	301	39	
Fluor edenite	RT	$Q^2$2Al	–78.5	136	1	98W1
		$Q^2$1Al	–82.0	140	22	
		$Q^3$1Al	–84.3	124	14	
		$Q^2$0Al	–86.8	186	34	
		$Q^3$0Al	–89.4	217	28	
Pargasite	RT	$Q^2$2Al	–78.7	141	8	98W1
		$Q^2$1Al	–82.1	196	41	
		$Q^3$1Al	–84.4	127	20	
		$Q^2$0Al	–86.1	170	20	
		$Q^3$0Al	–89.0	306	10	
Pargasite[7)]	RT		–87.5		21.1	94W1
			–86.1		14.5	
			–84.5		16.5	
			–82.0		38.1	
			–78.6		9.8	
Pargasite $Na_{0.2}Ca_2Mg_{4.8}Ga_{0.6}Si_{7.6}O_{22}F_2$	RT	T1(Si_3)	–92.5		43	99S2
		T2(Si_2)	–87.9		48	
		T2(SiGa)	–81.5		9	
Pargasite $Na_{0.4}Ca_2Mg_{4.6}Ga_{1.2}Si_{7.2}O_{22}F_2$	RT	T1(Si_3)	–92.1		34	99S2
		T2(Si_2)	–87.6		35	
		T1(Si_2Ga)	–84.6		17	
		T2(SiGa)	–80.8		14	
Pargasite $Na_{0.6}Ca_2Mg_{4.4}Ga_{1.8}Si_{6.8}O_{22}F_2$	RT	T1(Si_3)	–91.8		16	99S2
		T2(Si_2)	–87.8		37	
		T1(Si_2Ga)	–84.4		27	
		T2(SiGa)	–80.5		18	
		T2(Ga_2)	–76.3		0.4	
Pargasite $Na_{0.8}Ca_2Mg_{4.2}Ga_{2.4}Si_{6.4}O_{22}F_2$	RT	T1(Si_3)	–90.8		29	99S2
		T2(Si_2)	–86.3		22	
		T1(Si_2Ga)	–84.2		26	
		T2(SiGa)	–80.4		20	
		T2(Ga_2)	–76.0		4	

Table 9 (cont.)

Silicate	*T* [K]	Sites	Chem. shift *δ* [ppm]	Linewidth [Hz]	*A* [%]	Refs.
Pargasite						
$NaCa_2Mg_4Ga_3Si_6O_{22}F_2$	RT	T1(Si_3)	–89.8		20	99S2
		T1(SiGa) } T2(Si_2) }	–84.5		54	
		Ti2(SiGa)	–79.5		19	
		T2(Ga_2)	–75.0		8	
Richterite	RT		–84.5[8)]	62	2	98W1
		Q^2	–86.5	113	47	
		Q^3	–88.0	120	24	
		Q^3	–89.2	132	25	
			–91.0[9)]	115	2	
K richterite	RT		–84.5[8)]	101	4	98W1
		Q^2	–86.5	113	45	
		Q^3	–88.4	132	24	
		Q^3	–90.3	132	24	
			–92.2[9)]	111	3	
Fluor K richterite	RT	Q^2	–86.9	129	47	98W1
		Q^3	–89.2	134	26	
		Q^3	–91.0	129	24	
			92.4[9)]	85	2	
Rb richterite	RT		–84.2[8)]	92	2	98W1
		Q^2	–86.6	140	49	
		Q^3	–89.0	135	27	
		Q^3	–91.0	126	24	
			–92.8[9)]	71	1	
Sr richterite	RT		–88.0[10)]	185	100	98W1
Sr-K richterite	RT	Q^2	–87.8	108	51	98W1
		Q^3	–88.9	108	25	
		Q^3	–89.9	110	24	
			–85.6[11)]	55	–	
			–85.6[11)]	39	–	
$Na_3Mg_5Si_8O_{21}(OH)_3$	RT		–85.8	11		96L1
			–86.2	12		
			–86.7	8		
			–87.6	4		
			–88.7	28		
			–89.3	3		
			–89.7	2		
			–90.3	8		
			–90.8	24		

Table 9 (cont.)

Silicate	*T* [K]	Sites	Chem. shift *δ* [ppm]	Linewidth [Hz]	*A* [%]	Refs.
$Na_3Mg_5Si_8O_{21}(OH)_3$ (cont.)	513	Q^3(T1)	–85.6			96L1
		Q^2(T2)	–89.2			
^{27}Al						
Pargasite[7)]	RT	$^{[4]}$Al	68.5			94W1
		$^{[6]}$Al(M1,M3)	8.4			
		$^{[6]}$Al(M2)	–5.0			
Pargasite		$^{[4]}$Al	66.4			00H1
$(Ca_{1.8}Mg_{0.2})(Mg_{4.6}Al_{0.4})(Si_{7.6}Al_{0.4})O_{22}(OH)_2$		$^{[6]}$Al	3.8			
		$^{[6]}$Al	–3.1			
^{1}H						
Pargasite[7)]	RT		0.2		50	94W1
			1.2		50	
$Na_3Mg_5Si_8O_{21}(OH)_3$	RT and 373		–0.6 5.5 6.1			96L1
	403		–0.6			
			5.2			
	433… 513		–0.6 4.9			
^{23}Na						
Pargasite						
$Na_{0.2}Mg_{4.8}Ga_{0.6}Si_{7.6}O_{22}F_2$	RT		–23			99S2
Pargasite						
$NaCa_2Mg_4Ga_3Si_6O_{22}F_2$	RT		–27			99S2
$Na_3Mg_5Si_8O_{21}(OH)_3$	RT		–20			96L1
			≅0			
			–40			
^{19}F						
$NaCa_2Mg_4ScSi_6Al_2O_{22}F_2$	RT	MgMgMg[12)]	–171.7			87R2
		MgMgSc	–169.6			
^{71}Ga						
Pargasite	RT	$^{[4]}$Ga	232			99S2
$NaCa_2Mg_4Ga_3Si_6O_{22}F_2$		$^{[6]}$Ga	40			

1) $Ca_{1.79}{}^{[8]}Mg_{0.2}{}^{[6]}Mg_{5.0}Si_8O_{22}(OH)_2$;
2) peaks due to impurities were not listed;
3) $Ca_{1.88}{}^{[8]}Mg_{0.10}{}^{[6]}Mg_{4.67}{}^{[4]}Al_{0.29}{}^{[6]}Al_{0.33}Si_{7.71}$ per 23 O atoms;
4) $Ca_{1.85}{}^{[8]}Mg_{0.16}{}^{[6]}Mg_{4.63}{}^{[4]}Al_{0.66}{}^{[6]}Al_{0.64}Si_{7.34}$ per 23 O atoms;
5) $Ca_{1.91}{}^{[8]}Mg_{0.13}{}^{[6]}Mg_{4.11}{}^{[4]}Al_{1.0}{}^{[6]}Al_{0.88}Si_7$ per 23 O atoms;

Table 9 (cont.)

6) $Ca_{1.88}{}^{[8]}Mg_{0.10}{}^{[6]}Mg_{4.06}{}^{[4]}Al_{0.9}{}^{[6]}Al_{0.94}Si_{7.1}$ per 23 O atoms;
7) $NaCa_2(Mg_4Al)(Si_6Al_2)O_{22}(OH)_2$;
8) Clinopyroxene impurity;
9) Tremolite-like vacant A-site;
10) The spectrum of Sr richterite has considerable peak overlap and it was not possible to obtain meaningful peak intensities;
11) C2/m polymorph of hydro-sodian magnesiocummingtonite;
12) F coordination;
a) The chemical shifts for ^{29}Si and ^{1}H are relative to tetrametylsilane (TMS), for ^{27}Al relative to 1M $Al(NO_3)_3$ solution, for ^{19}F relative to $CFCl_3$, for ^{23}Na relative to NaCl in aqueous solution, for ^{71}Ga relative to gallium chloride.

Table 10. Activation energy for conduction.

Silicate	Temperature range	Activation energy [eV]	Refs.
Mg-rich amphibole			
[001]	T<300°C	0.54	73T1
[010]		0.57	
Riebeckite (crocidolite)			
[001]	≅ 280°C	0.69	65L1
	60…90°C	0.33	
Arfvedsonite	30…800°C	≅ 0.4	96S1

Table 11. Refractive indices

Silicate	Refractive indices			2V			Refs.
	n_α	n_β	n_γ	Exp.	Calc.		
Anthophyllite[1)]	1.6120	1.6248	1.6336	103.8°			01E1
Anthophyllite[2)]	1.6263	1.6359	1.6475	83.7°			01E1
Protoferro-anthophyllite[3)]	1.690	1.710	1.726	87°			98S1
Protomangano-ferro-anthophyllite[4)]	1.695	1.714	1.731	76°			98S1
Ferro-anthophyllite[5)]	1.694	1.710	1.722	82°		biaxial negative	57S1
Holmquistite[6)]	1.6198(4)	1.6398(4)	1.6451(5)	53.0°	53.9°		89W1
Holmquistite[7)]	1.622	1.642	1.645	49°			60N1
Clinoholmquistite[8)]	1.610	1.627	1.633	55°…61°			65G3
Ferroholmquistite[9)]	1.628	1.646	1.651		55.1°	biaxial negative	05C1
Cummingtonite – grunerite[10)]	1.719(1)	1.700(1)	1.679(1)	94°	93°52’		64K1
Cummingtonite – grunerite[11)]	1.694(1)	1.675(1)	1.666(1)		83°36’		64K1
Cummingtonite – grunerite[12)]	1.693(1)	1.675(1)	1.659(1)	82°	88°02’		64K1

Table 11 (cont.)

Silicate	Refractive indices			2*V*			Refs.
	n_α	n_β	n_γ	Exp.	Calc.		
Cummingtonite – grunerite[13)]	1.665(1)	1.651(1)	1.638(1)		89°02'		64K1
Actinolite[14)]	1.648	1.663	1.674		81°		71M1
Edenite[15)]	1.642(2)	1.632(2)	1.620(2)		84°		91B1
Potassium pargasite[16)]	1.648(2)	1.654(2)	1.664(2)	75(5) °		biaxial positive	85M1
Al-rich pargasite[17)]	1.636(1)	1.639(1)	1.652(1)	54(2)°	55(2)°		73B3
Potassian-titanian-magnesiohastingsite [18)]	1.653	1.664	1.673	84°			81W1
Magnesiohastingsite[19)]	1.642… 1.657[20)]		1.653… 1.672[20)]				73S1
Sadanagaite[21)]	1.673(2)	1.684(2)	1.697(2)	80°…90°	86°		84S1
Magnesiosadanagaite[22)]	1.674(2)	1.686(2)	1.699(2)	90°	88°		84S1
Obertiite[23)]	1.643(1)	1.657(1)	1.670(3)	81(1) °	93°	biaxial negative	00H1
Glaucophane[24)]	1.615(3)		1.635(3)				70E1
Magnesio-arfvedsonite[25)]	1.634						74M2
Fluoro-magnesio-arfvedsonite[26)]	1.618	1.629	1.632	50°…70°		biaxial positive	00B1
Magnesioriebeckite [27)]	1.698(3)		1.706(6)				70E1
$Na_2CaMg_5Si_8O_{22}(OH)_2$	1.604(5)		1.622(3)				74C1
$Na_2CaFe_5Si_8O_{22}(OH)_2$	1.690(5)		1.710(4)				74C1
$Li_{0.64}Na_{0.05}Li_{0.48}Mg_{1.52}$-$Mg_{5.00}Si_{7.93}O_{21.91}F_{2.09}$	1.5759	1.5870	1.3928	74°	71.4°		60G1
Magnesioriebeckite [28)]	1.666(3)		1.675(3)				70E1
Leakeite[29)]	1.667(1)	1.675(1)	1.691(1)	59°…71°		biaxial negative	92H1
Fluoro-nyböite[30)]				undet.		biaxial negative	03O1
Ferripedrizite[31)]	1.695(1)	1.700(2)	1.702(1)	125(17)°		biaxial positive	02C1
Sodic ferripedrizite[32)]	1.694(1)	1.698(1)	1.702()1)	83(2)°	85(3)°	biaxial positive	00O1
Ungarettiite[33)]	1.717(2)	1.780(4)	1.800(2)	51(2)°		biaxial positive	95H3
Dellaventuraite[34)]	1.688(3)	1.692(5)	1.721(3)	49(3)°	41°	biaxial positive	05T1

1) $Na_{0.021}Ca_{0.069}Ni_{0.015}Mn_{0.014}Mg_{6.142}Fe_{0.704}Cr_{0.016}Ti_{0.001}Al_{0.039}(Si_{7.923}Al_{0.077})O_{22}(OH)_{1.992}$;

2) $Na_{0.023}K_{0.002}Na_{0.007}Ca_{0.097}Ni_{0.011}Mn_{0.041}Mg_{5.299}Fe_{1.454}Cr_{0.021}Ti_{0.003}Al_{0.067}(Si_{7.888}Al_{0.112})O_{22}OH_{1.995}Cl_{0.002}F_{0.013}$;

3) $(Fe_{0.80}Mn_{0.20})_2(Fe_{0.98}Mg_{0.02})_5(Si_4O_{11})_2(OH)_2$;

4) $(Fe_{0.30}Mn_{0.70})_2(Fe_{0.82}Mg_{0.18})_5(Si_4O_{11})_2(OH)_2$;

5) $(K_{0.01}Na_{0.33}Mg_{0.01}Mn_{0.31}Fe^{2+}{}_{4.40}Fe^{3+}{}_{0.35}Ti_{0.06}Al_{1.68})(Al_{1.97}Si_{6.03})O_{21.79}(OH)_{2.15}F_{0.06}$;

6) $(Na_{0.04}Ca_{0.02}Li_{1.91})(Mg_{1.98}Fe_{1.05}Mn_{0.03}Ti_{0.01}Al_{1.93})(Al_{0.13}Si_{7.87})O_{22}(OH)_2$;

7) $(Na_{0.05}K_{0.03}Ca_{0.08}Li_{1.90})(Mg_{2.01}Mn_{0.02}Fe^{2+}{}_{0.99})(Al_{1.75}Fe^{3+}{}_{0.03}Ti_{0.02})Si_{7.92}O_{22.06}(OH)_{1.84}F_{0.10}$;

Table 11 (cont.)

8) $(Na_{0.45}Ca_{0.05}K_{0.04})(Li_{1.79}Ca_{0.21})(Al_{2.21}Mg_{1.93}Fe^{2+}{}_{0.68}Li_{0.08}Fe^{3+}{}_{0.05}Mn_{0.05})Si_8O_{22}O_{0.98}F_{0.74}(OH)_{0.28}$;
9) $^{A}(K_{0.01}Na_{0.01})^{B}(Li_{1.88}Mg_{0.08}Na_{0.03}Fe^{2+}{}_{0.01})^{C}(Al_{1.89}Fe^{2+}{}_{1.70}Mg_{1.39}Mn^{2+}{}_{0.02})Si_{8.00}O_{22}(OH)_{1.97}F_{0.03}$;
10) $Ca_{0.06}Mg_{0.77}Mn_{0.05}Fe_{6.14}Si_8O_{22}(OH)_{1.39}F_{0.51}$;
11) $Ca_{0.16}Mg_{2.37}Mn_{0.09}Fe_{4.44}(Si_{7.95}Al_{0.02})O_{22}(OH)_{2.04}$;
12) $K_{0.04}Na_{0.02}Ca_{0.02}Mg_{2.46}Mn_{0.03}Fe_{4.42}Al_{0.02}(Si_{7.97}Al_{0.03})O_{22}(OH)_{2.02}$;
13) $Na_{0.03}Ca_{0.19}Mg_{3.69}Mn_{1.63}Fe_{1.35}Al_{0.02}Si_{8.02}O_{22}(OH)_{1.99}F_{0.10}$;
14) $(Ca_{0.875}Na_{0.04}Mn_{0.08})_2(Fe^{2+}{}_{0.506}Fe^{3+}{}_{0.06}Mg_{0.375}Mn_{0.044}Al_{0.014}Ti_{0.002}Cr_{0.002})_5(Si_{0.955}Al_{0.045})_8O_{22}(OH)_{1.97}F_{0.03}$;
15) $(Na_{0.47}K_{0.01}Ca_{0.03})(Ca_{1.03}Mn_{0.97})(Mg_{4.55}Mn_{0.31}Al_{0.10}Fe_{0.04})(Si_{7.49}Al_{0.51})O_{22.13}(OH)_{1.87}$;
16) Composition not mentioned.
17) $Na_{0.67}K_{0.17}Ca_{1.99}Mg_{3.62}Fe_{0.07}Ti_{0.27}Al_{1.12}Si_{5.75}Al_{2.25}O_{22}F_{0.58}Cl_{0.02}(OH)_{1.05}$;
18) $K_{0.35}Na_{0.63}(Ca_{1.90}Na_{0.10})(Al_{0.02}Ti^{4+}{}_{0.35}Fe^{3+}{}_{0.86}Fe^{2+}{}_{0.68}Mn^{2+}{}_{0.02}Mg_{3.07})(Si_{5.94}Al_{2.06})O_{22}(OH)_{1.60}$;
19) $NaCa_2Mg_4FeSi_6Al_2O_{22}(OH)_2$;
20) According to preparation conditions;
21) $(K_{0.62}Na_{0.37})Ca_2(Mg_{1.48}Mn_{0.06}Fe^{2+}{}_{1.94}Fe^{3+}{}_{0.39}Ti_{0.25}Al_{0.88})(Si_{5.24}Al_{2.76})O_{22}(OH)_2$;
22) $(K_{0.75}Na_{0.22})Ca_{2.07}(Mg_{1.84}Mn_{0.01}Fe^{2+}{}_{1.37}Fe^{3+}{}_{0.39}Ti_{0.38}Al_{0.94})(Si_{4.95}Al_{3.05})O_{22}(OH)_2$;
23) $NaNa_2(Mg_3Fe^{3+}Ti^{4+})Si_8O_{22}O_2$ (ideal formula; see Table 4, footnote [102)]);
24) $(Ca_{0.199}Na_{1.833}K_{0.003})(Mn_{0.008}Mg_{2.368}Fe^{2+}{}_{0.695}Fe^{3+}{}_{0.295}Ti_{0.068}Al_{1.529})(Si_{7.880}Al_{0.120})O_{22}(OH)_2$;
25) $(Na_{0.486}K_{0.275})(Mg_{3.323}Fe^{2+}{}_{0.318}Fe^{3+}{}_{1.076}Al_{0.069}Ti_{0.034})(Na_{1.845}Ca_{0.155})Si_{8.05}O_{22}(OH)_{2.441}F_{0.476}$;
26) $(Na_{0.44}K_{0.29})(Na_{1.57}Ca_{0.43})(Mg_{4.14}Mn_{0.03}Fe^{2+}{}_{0.09}Fe^{3+}{}_{0.60}Ti_{0.05}Al_{0.09})(Si_{7.85}Al_{0.15})O_{22}(F_{1.22}(OH)_{0.78})$;
27) $(Ca_{0.037}Na_{1.816})(Al_{0.022}Fe^{3+}{}_{2.149}Fe^{2+}{}_{2.492}Mg_{0.315})(Si_{7.985}Al_{0.015})O_{22}(OH)_2$;
28) $(Ca_{0.336}Na_{1.865}K_{0.026})(Mn_{0.009}Mg_{2.609}Fe^{2+}{}_{0.624}Fe^{3+}{}_{1.796}Ti_{0.009})(Si_{7.903}Al_{0.034})O_{22}(OH)_2$;
29) $(K_{0.20}Na_{0.75})(Na_{1.92}Ca_{0.08})(Mg_{2.32}Fe^{3+}{}_{1.31}Mn^{3+}{}_{0.42}Al_{0.14}Li_{0.81})(Si_{7.93}Al_{0.07})O_{22}(OH)_{1.49}F_{0.51}$;
30) $(Na_{0.78}K_{0.06})(Na_{1.53}Ca_{0.47})(Mg_{2.55}Fe^{2+}{}_{0.89}Mn_{0.01}Zn_{0.01}Fe^{3+}{}_{0.32}Al_{1.21}Ti_{0.01})(Si_{7.14}Al_{0.86})O_{22}F_{1.16}(OH)_{0.84})$;
31) $^{A}Na^{B}Li_2(Fe^{3+}{}_2Mg_2Li)Si_8O_{22}(OH)_2$ (ideal formula; see Table 4, footnote [107)]);
32) $(Na_{0.70}K_{0.03})(Li_{1.34}Na_{0.58}Ca_{0.08})(Mg_{1.75}Fe^{3+}{}_{1.65}Li_{0.88}Fe^{2+}{}_{0.32}Al_{0.21}Ti_{0.11}Mn^{2+}{}_{0.07}Zn_{0.01})Si_{8.00}O_{22}(OH)_{1.35}F_{0.65}$;
33) $(Na_{0.82}K_{0.15})(Na_{1.97}Ca_{0.03})(Mn^{2+}{}_{1.66}Mg_{0.34}Mn^{3+}{}_{2.96}Fe^{3+}{}_{0.06}Zn_{0.01})(Si_{7.99}Al_{0.01})O_{22}O_2$;
34) $(K_{0.40}Na_{0.61})(Na_{1.71}Ca_{0.29})(Mg_{1.81}Zn_{0.01}Ni_{0.02}Li_{0.90}Fe^{3+}{}_{0.71}Mn^{3+}{}_{0.85}Ti^{4+}{}_{0.60}Al_{0.10})(Si_{7.96}Al_{0.04})O_{22}(OH_{0.80}O_{1.20})$.