

**Table S2.1.** Average chemical composition and atoms per formula unit (a.p.f.u) for the different zones of Federico sample (Catri, Sant' Ilario in Campo, Elba Island, Italy) with the relative empirical formula.

	<b>Prismatic section</b>	<b>Termination</b>
	<b>Z1</b>	<b>Z2</b>
	<i>n</i> = 5	<i>n</i> = 19
SiO <sub>2</sub> wt%	38.77(34)	35.99(35)
TiO <sub>2</sub>	0.03(2)	0.03(2)
B <sub>2</sub> O <sub>3</sub>	11.30 <sup>a</sup>	10.32 <sup>a</sup>
Al <sub>2</sub> O <sub>3</sub>	43.09(59)	34.66(59)
FeO <sub>tot</sub>	0.01(1)	13.33(57)
MnO	0.44(32)	0.25(5)
CaO	0.03(2)	0.14(8)
Na <sub>2</sub> O	1.85(9)	1.59(21)
Li <sub>2</sub> O	1.88 <sup>b</sup>	0.21 <sup>b</sup>
F	0.51(17)	0.35(23)
H <sub>2</sub> O	3.51 <sup>a</sup>	3.00 <sup>a</sup>
-O ≡ F	-0.22	-0.14
FeO	0.01 <sup>c</sup>	13.33 <sup>c</sup>
Fe <sub>2</sub> O <sub>3</sub>	-	-
Total	101.25	99.81
<b>Atoms normalized to 31 anions</b>		
Si apfu	6.004	6.059
Ti	0.003	0.004
B	3.000	3.000
Al	7.780	6.877
Fe <sup>3+</sup>	-	-
Fe <sup>2+</sup>	0.001	1.877
Mn <sup>2+</sup>	0.057	0.035
Ca	0.004	0.025
Na	0.551	0.519
Li	1.163	0.142
F	0.250	0.184
OH	3.650	3.371
OH+F	3.851	3.555
<b>Species</b>	<b>Elbaite</b>	<b>Schorl</b>

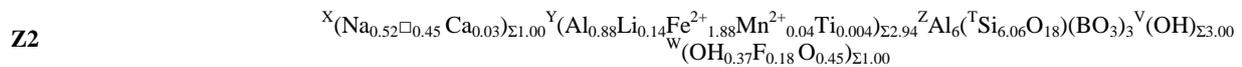
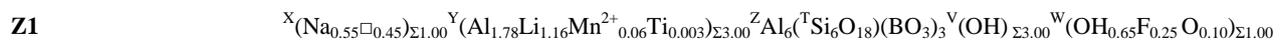
<sup>a</sup> Calculated by stoichiometry (see text)

<sup>b</sup> Estimated with the procedure of Pesquera et al. (2016)

<sup>c</sup> Determined by Mössbauer spectroscopy

Errors for oxides and fluorine are standard deviations (in brackets)

### Empirical chemical formulae



**Table S2.2.** Average chemical composition and atoms per formula unit (a.p.f.u) for the different zones of Giganti Storti sample (San Piero in Campo, Elba Island, Italy) with the relative empirical formula.

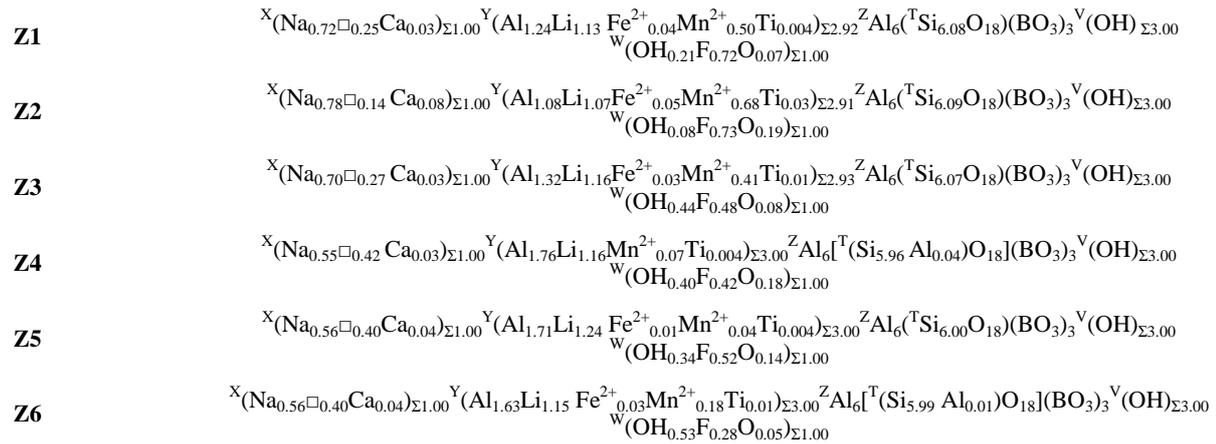
	Analogous		Prismatic section			Termination
	Z1 n = 1	Z2 n = 3	Z3 n = 6	Z4 n = 11	Z5 n = 10	Z6 n = 4
SiO <sub>2</sub> wt%	38.42	37.95(15)	38.58(23)	38.55(29)	38.71(26)	38.17(71)
TiO <sub>2</sub>	0.04	0.21(1)	0.06(4)	0.03(2)	0.03(2)	0.07(2)
B <sub>2</sub> O <sub>3</sub>	10.98 <sup>a</sup>	10.83 <sup>a</sup>	11.04 <sup>a</sup>	11.24 <sup>a</sup>	11.22 <sup>a</sup>	11.08 <sup>a</sup>
Al <sub>2</sub> O <sub>3</sub>	38.79	37.44(13)	39.46(61)	42.81(47)	42.25(15)	41.36(76)
FeO <sub>tot</sub>	0.27	0.36(7)	0.22(5)	0.03(3)	0.06(3)	0.21(5)
MnO	3.73	4.97(14)	3.07(51)	0.51(40)	0.26(11)	1.36(40)
CaO	0.15	0.45(14)	0.15(4)	0.17(7)	0.26(6)	0.04(3)
Na <sub>2</sub> O	2.36	2.51(4)	2.29(8)	1.83(6)	1.87(6)	2.23(7)
Li <sub>2</sub> O	1.77 <sup>b</sup>	1.66 <sup>b</sup>	1.83 <sup>b</sup>	1.87 <sup>b</sup>	1.99 <sup>b</sup>	1.83 <sup>b</sup>
F	1.44	1.44(24)	0.97(11)	0.86(24)	1.06(9)	0.57(10)
H <sub>2</sub> O	3.04 <sup>a</sup>	2.87 <sup>a</sup>	3.27 <sup>a</sup>	3.30 <sup>a</sup>	3.23 <sup>a</sup>	3.37 <sup>a</sup>
Total	100.50	100.16	100.62	100.95	100.61	100.11
<b>Atomic fractions normalized to 31 anions</b>						
Si apfu	6.083	6.091	6.072	5.958	5.996	5.986
Ti	0.004	0.026	0.008	0.004	0.004	0.008
B	3.000	3.000	3.000	3.000	3.000	3.000
Al	7.238	7.083	7.320	7.800	7.713	7.644
Fe <sup>2+</sup>	0.035	0.049	0.028	0.004	0.007	0.027
Mn <sup>2+</sup>	0.501	0.675	0.410	0.067	0.035	0.180
Ca	0.026	0.077	0.025	0.029	0.043	0.008
Na	0.724	0.781	0.697	0.549	0.561	0.678
Li	1.127	1.072	1.158	1.163	1.240	1.154
F	0.719	0.731	0.484	0.419	0.521	0.282
OH	3.213	3.078	3.438	3.400	3.341	3.530
OH+F	3.932	3.808	3.922	3.819	3.862	3.812
<b>Species</b>	<b>Fluor-elbaite</b>	<b>Fluor-elbaite</b>	<b>Fluor-elbaite</b>	<b>Fluor-elbaite</b>	<b>Fluor-elbaite</b>	<b>Elbaite</b>

<sup>a</sup> Calculated by stoichiometry (see text)

<sup>b</sup> Estimated with the procedure of Pesquera et al. (2016)

Errors for oxides and fluorine are standard deviations (in brackets)

#### Empirical chemical formulae



**Table S2.3.** Average chemical composition and atoms per formula unit (a.p.f.u) for the different zones of Pastori sample (Catri, Sant’Ilario in Campo, Elba Island, Italy)

	Prismatic section									Termination	
	Z1 n = 21	Z2 n = 1	Z3 n = 1	Z4 n = 1	Z5 n = 2	Z6 n = 2	Z7 n = 1	Z8 n = 1	Z9 n = 3	Z10 n = 3	Z11 n = 16
SiO <sub>2</sub> wt%	37.63(30)	37.45	37.13	35.92	37.68(29)	36.48(1)	37.37	37.49	38.20(15)	36.04(72)	36.85(32)
TiO <sub>2</sub>	0.30(4)	0.22	0.26	0.35	0.26(1)	0.30(1)	0.26	0.25	0.25(2)	0.40(5)	0.29(13)
B <sub>2</sub> O <sub>3</sub>	10.83 <sup>a</sup>	10.67 <sup>a</sup>	10.57 <sup>a</sup>	10.27 <sup>a</sup>	10.71 <sup>a</sup>	10.43 <sup>a</sup>	10.69 <sup>a</sup>	10.69 <sup>a</sup>	10.89 <sup>a</sup>	10.25 <sup>a</sup>	10.55 <sup>a</sup>
Al <sub>2</sub> O <sub>3</sub>	38.65(95)	36.78	35.87	33.87	36.55(32)	35.10(1)	37.23	36.30	38.10(52)	33.44(78)	33.30(66)
FeO <sub>tot</sub>	1.59(88)	4.24	5.91	11.59	4.37(97)	8.29(18)	3.28	6.26	2.64(80)	11.50(87)	10.41(88)
MnO	2.07(37)	1.40	1.61	0.96	1.83(44)	1.09(12)	1.80	1.23	1.46(20)	0.65(5)	0.06(3)
ZnO	0.04(4)	-	0.06	0.12	0.10	0.19(11)	0.06	0.13	0.05(4)	0.06(2)	0.03(3)
MgO	-	0.03	-	-	-	-	-	0.11	0.01(1)	-	3.13(68)
CaO	0.51(7)	0.24	0.13	0.04	0.17(2)	0.09(3)	0.18	0.17	0.21(6)	0.07(3)	0.09(12)
Na <sub>2</sub> O	2.01(10)	2.30	2.26	1.65	2.23(7)	2.04(1)	2.22	2.17	2.08(10)	1.64(15)	1.49(16)
Li <sub>2</sub> O	1.73 <sup>b</sup>	1.57 <sup>b</sup>	1.31 <sup>b</sup>	0.49 <sup>b</sup>	1.53 <sup>b</sup>	0.98 <sup>b</sup>	1.61 <sup>b</sup>	1.30 <sup>b</sup>	1.78 <sup>b</sup>	0.63 <sup>b</sup>	0.33 <sup>b</sup>
F	1.17(20)	1.59	1.24	1.05	1.38(10)	1.03(18)	1.17	1.01	0.83(7)	0.51(10)	0.29(12)
H <sub>2</sub> O	3.04	2.83	2.94	2.85	2.99	2.96	3.07 <sup>a</sup>	3.11 <sup>a</sup>	3.36 <sup>a</sup>	3.12 <sup>a</sup>	3.50 <sup>a</sup>
-O ≡ F	-0.49	-0.67	-0.52	-0.44	-0.58	-0.43	-0.49	-0.43	-0.35	-0.21	-0.12
FeO	1.59	4.24	5.91	11.59	4.37	8.29	3.28	6.26	2.64	11.09 <sup>c</sup>	10.41
Fe <sub>2</sub> O <sub>3</sub>	-	-	-	-	-	-	-	-	-	0.41 <sup>c</sup>	-
Total	99.15	98.66	98.76	98.72	99.23	98.55	98.45	99.80	99.52	98.10	100.33
<b>Atomic fractions normalized to 31 anions</b>											
Si apfu	6.038	6.102	6.115	6.097	6.116	6.080	6.078	6.098	6.099	6.112	6.068
Ti	0.036	0.027	0.032	0.044	0.031	0.037	0.031	0.030	0.030	0.051	0.036
B	3.000	3.000	3.000	3.000	3.000	3.000	2.990	3.000	3.000	3.000	3.000
Al	7.309	7.064	6.952	6.753	6.993	6.894	7.131	6.958	7.170	6.682	6.463
Fe <sup>3+</sup>	-	-	-	-	-	-	-	-	-	0.052	-
Fe <sup>2+</sup>	0.213	0.578	0.813	1.640	0.593	1.155	0.446	0.852	0.353	1.572	1.434
Mn <sup>2+</sup>	0.282	0.193	0.224	0.138	0.251	0.154	0.248	0.169	0.198	0.093	0.008
Zn	0.004	-	0.007	0.015	0.012	0.023	0.007	0.016	0.006	0.008	0.000
Mg	-	0.007	-	-	-	-	-	0.027	0.002	-	0.768
Ca	0.087	0.042	0.023	0.007	0.030	0.016	0.031	0.029	0.036	0.012	0.016
Na	0.627	0.727	0.721	0.541	0.701	0.659	0.700	0.685	0.643	0.539	0.475
Li	1.116	1.029	0.867	0.333	0.999	0.657	1.053	0.850	1.143	0.429	0.219
F	0.594	0.817	0.645	0.562	0.710	0.543	0.602	0.522	0.420	0.274	0.150
OH	3.250	3.076	3.229	3.220	3.238	3.295	3.334	3.369	3.578	3.529	3.844
OH+F	3.844	3.893	3.874	3.782	3.948	3.838	3.936	3.891	3.998	3.803	3.994
<b>Species</b>	<b>Fluor-elbaite</b>	<b>Fluor-elbaite</b>	<b>Fluor-elbaite</b>	<b>Fluor-schorl</b>	<b>Fluor-elbaite</b>	<b>Fluor-elbaite</b>	<b>Fluor-elbaite</b>	<b>Fluor-elbaite</b>	<b>Elbaite</b>	<b>Schorl</b>	<b>Foitite</b>

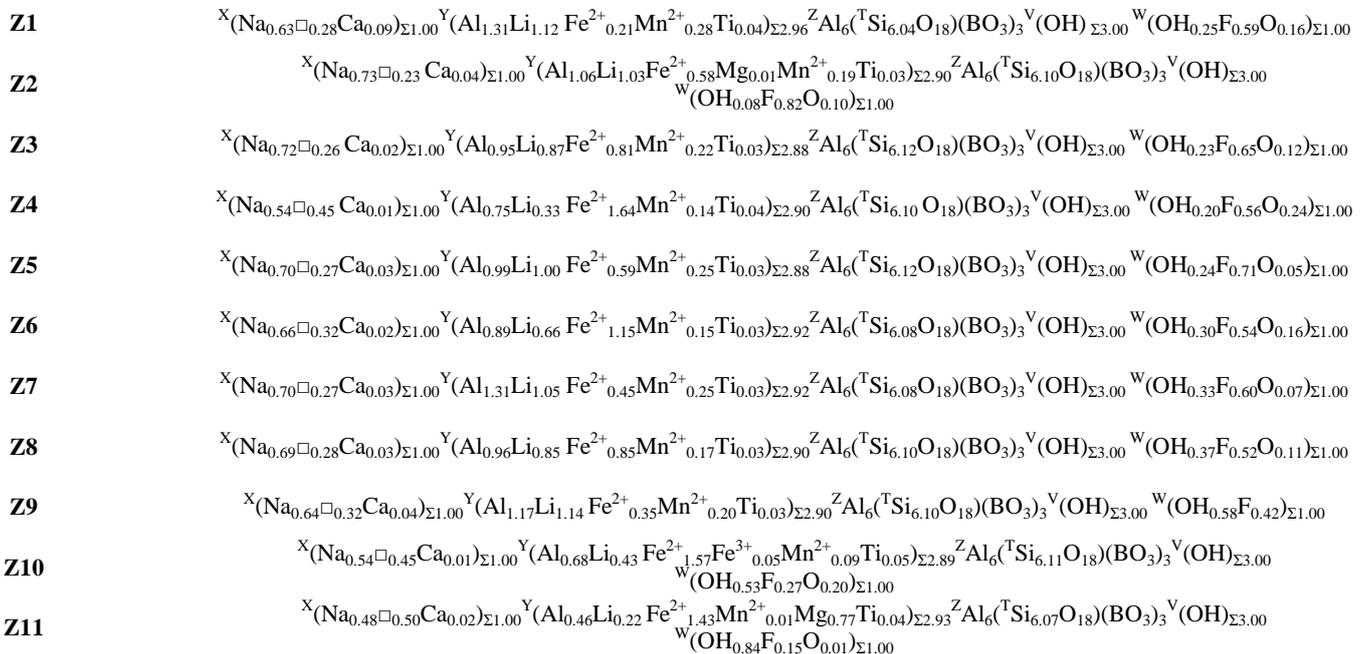
<sup>a</sup> Calculated by stoichiometry (see text);

<sup>b</sup> Estimated with the procedure of Pesquera et al. (2016);

<sup>c</sup> Determined by Mössbauer spectroscopy

Errors for oxides and fluorine are standard deviations (in brackets)

**Empirical chemical formulae**



**Table S2.4.** Average chemical composition and atoms per formula unit (a.p.f.u) for the different zones of Rosina 2 sample (San Piero in Campo, Elba Island, Italy) with the relative empirical formula.

	Prismatic section		Termination					
	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8
	n = 17	n = 1	n = 5	n = 1	n = 1	n = 1	n = 1	n = 2
SiO <sub>2</sub> wt%	37.65(32)	36.91	36.43(30)	37.77	36.98	37.62	37.09	37.48(4)
TiO <sub>2</sub>	0.12(3)	0.24	0.13(3)	0.09	0.05	0.06	0.09	0.05(1)
B <sub>2</sub> O <sub>3</sub>	11.04 <sup>a</sup>	10.76 <sup>a</sup>	10.61 <sup>a</sup>	10.95 <sup>a</sup>	10.74 <sup>a</sup>	10.89 <sup>a</sup>	10.68 <sup>a</sup>	10.83 <sup>a</sup>
Al <sub>2</sub> O <sub>3</sub>	41.30(35)	38.46	35.96(40)	38.46	38.47	39.03	35.78	37.02(49)
FeO <sub>tot</sub>	0.09(10)	1.50	1.83(81)	0.59	0.41	0.63	2.36	1.39(8)
MnO	3.54(22)	5.48	11.55(40)	8.49	5.51	4.87	9.85	9.69(35)
MgO	-	0.02	0.02(1)	0.01	-	0.05	0.03	0.05(1)
CaO	0.06(3)	0.07	0.01(1)	0.03	0.01	0.02	-	-
Na <sub>2</sub> O	1.87(7)	2.25	1.33(3)	1.56	1.48	1.49	1.33	1.19(13)
K <sub>2</sub> O	0.01(1)	0.00	0.01(1)	0.03	0.00	0.04	0.01	0.02(2)
Li <sub>2</sub> O <sup>b</sup>	1.44 <sup>b</sup>	1.12 <sup>b</sup>	0.33 <sup>b</sup>	0.91 <sup>b</sup>	1.32 <sup>b</sup>	1.40 <sup>b</sup>	0.61 <sup>b</sup>	0.71 <sup>b</sup>
F	0.63(16)	1.07	0.32(10)	0.32	0.18	0.12	0.18	0.10(14)
H <sub>2</sub> O	3.28 <sup>a</sup>	2.92 <sup>a</sup>	3.39 <sup>a</sup>	3.51 <sup>a</sup>	3.68 <sup>a</sup>	3.75 <sup>a</sup>	3.59 <sup>a</sup>	3.71 <sup>a</sup>
-O ≡ F	-0.27	-0.45	-0.13	-0.13	-0.07	-0.05	-0.08	-0.04
FeO	0.09	-	1.83	0.59	0.41	0.63	2.27 <sup>c</sup>	1.39
Fe <sub>2</sub> O <sub>3</sub>	-	-	-	-	-	-	0.09 <sup>c</sup>	-
Total	100.80	100.35	101.82	102.60	98.77	99.97	101.56	102.23
<b>Atoms normalized to 31 anions</b>								
Si apfu	5.927	5.963	5.976	5.994	5.986	6.001	6.038	6.016
Ti	0.014	0.029	0.016	0.011	0.006	0.007	0.011	0.006
B	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000
Al	7.663	7.322	6.942	7.193	7.338	7.339	6.864	7.003
Fe <sup>3+</sup>	-	-	-	-	-	-	0.012	-
Fe <sup>2+</sup>	0.012	0.203	0.251	0.078	0.055	0.084	0.309	0.187
Mn <sup>2+</sup>	0.472	0.750	1.602	1.141	0.755	0.658	1.358	1.317
Mg	0.000	0.000	0.005	0.002	0.000	0.012	0.007	0.012
Ca	0.010	0.012	0.002	0.005	0.002	0.007	0.000	0.001
Na	0.572	0.704	0.422	0.480	0.407	0.459	0.419	0.369
K	0.002	0.000	0.002	0.005	0.000	0.008	0.001	0.003
Li	0.912	0.728	0.217	0.581	0.859	0.898	0.399	0.458
F	0.316	0.545	0.167	0.161	0.092	0.062	0.093	0.058
OH	3.449	3.144	3.704	3.714	3.975	3.985	3.900	3.975
OH+F	3.765	3.689	3.871	3.875	4.067	4.048	3.992	4.026
<b>Species</b>	<b>Elbaite</b>	<b>Fluor-elbaite</b>	<b>Celleriite</b>	<b>Celleriite</b>	<b>Rossmannite</b>	<b>Rossmannite</b>	<b>Celleriite</b>	<b>Celleriite</b>

<sup>a</sup> Calculated by stoichiometry (see text);

<sup>b</sup> Estimated with the procedure of Pesquera et al. (2016);

<sup>c</sup> Determined by Mössbauer spectroscopy

Errors for oxides and fluorine are standard deviations (in brackets)

#### Empirical chemical formulae

<b>Z1</b>	$X(\text{Na}_{0.57}\square_{0.42}\text{Ca}_{0.01})_{\Sigma 1.00} Y(\text{Al}_{1.59}\text{Li}_{0.91}\text{Fe}^{2+}_{0.01}\text{Mn}^{2+}_{0.47}\text{Ti}_{0.01})_{\Sigma 3.00} Z\text{Al}_6[\text{T}(\text{Si}_{5.93}\text{Al}_{0.07})\text{O}_{18}](\text{BO}_3)_3^V(\text{OH})_{\Sigma 3.00} W(\text{OH}_{0.45}\text{F}_{0.32}\text{O}_{0.23})_{\Sigma 1.00}$
<b>Z2</b>	$X(\text{Na}_{0.70}\square_{0.29}\text{Ca}_{0.01})_{\Sigma 1.00} Y(\text{Al}_{1.28}\text{Li}_{0.73}\text{Fe}^{2+}_{0.20}\text{Mn}^{2+}_{0.75}\text{Ti}_{0.03})_{\Sigma 3.00} Z\text{Al}_6[\text{T}(\text{Si}_{5.96}\text{Al}_{0.04})\text{O}_{18}](\text{BO}_3)_3^V(\text{OH})_{\Sigma 3.00} W(\text{OH}_{0.14}\text{F}_{0.54}\text{O}_{0.32})_{\Sigma 1.00}$
<b>Z3</b>	$X(\text{Na}_{0.42}\square_{0.58})_{\Sigma 1.00} Y(\text{Al}_{0.92}\text{Li}_{0.22}\text{Fe}^{2+}_{0.25}\text{Mn}^{2+}_{1.60}\text{Ti}_{0.02})_{\Sigma 3.00} Z\text{Al}_6[\text{T}(\text{Si}_{5.98}\text{Al}_{0.02})\text{O}_{18}](\text{BO}_3)_3^V(\text{OH})_{\Sigma 3.00} W(\text{OH}_{0.70}\text{F}_{0.17}\text{O}_{0.13})_{\Sigma 1.00}$
<b>Z4</b>	$X(\text{Na}_{0.48}\square_{0.51}\text{Ca}_{0.01})_{\Sigma 1.00} Y(\text{Al}_{1.18}\text{Li}_{0.58}\text{Fe}^{2+}_{0.08}\text{Mn}^{2+}_{1.14}\text{Ti}_{0.01})_{\Sigma 3.00} Z\text{Al}_6[\text{T}(\text{Si}_{5.99}\text{Al}_{0.01})\text{O}_{18}](\text{BO}_3)_3^V(\text{OH})_{\Sigma 3.00} W(\text{OH}_{0.71}\text{F}_{0.16}\text{O}_{0.13})_{\Sigma 1.00}$
<b>Z5</b>	$X(\text{Na}_{0.41}\square_{0.59})_{\Sigma 1.00} Y(\text{Al}_{1.33}\text{Li}_{0.86}\text{Fe}^{2+}_{0.06}\text{Mn}^{2+}_{0.76}\text{Ti}_{0.01})_{\Sigma 3.00} Z\text{Al}_6[\text{T}(\text{Si}_{5.99}\text{Al}_{0.01})\text{O}_{18}](\text{BO}_3)_3^V(\text{OH})_{\Sigma 3.00} W(\text{OH}_{0.97}\text{F}_{0.03})_{\Sigma 1.00}$
<b>Z6</b>	$X(\text{Na}_{0.46}\square_{0.53}\text{Ca}_{0.01})_{\Sigma 1.00} Y(\text{Al}_{1.34}\text{Li}_{0.90}\text{Fe}^{2+}_{0.08}\text{Mn}^{2+}_{0.66}\text{Ti}_{0.01})_{\Sigma 3.00} Z\text{Al}_6[\text{T}(\text{Si}_{6.00}\text{O}_{18})](\text{BO}_3)_3^V(\text{OH})_{\Sigma 3.00} W(\text{OH}_{0.98}\text{F}_{0.02})_{\Sigma 1.00}$
<b>Z7</b>	$X(\text{Na}_{0.42}\square_{0.58})_{\Sigma 1.00} Y(\text{Al}_{0.86}\text{Li}_{0.40}\text{Fe}^{2+}_{0.31}\text{Mn}^{2+}_{1.36}\text{Ti}_{0.01})_{\Sigma 2.96} Z\text{Al}_6[\text{T}(\text{Si}_{6.04}\text{O}_{18})](\text{BO}_3)_3^V(\text{OH})_{\Sigma 3.00} W(\text{OH}_{0.90}\text{F}_{0.09}\text{O}_{0.01})_{\Sigma 1.00}$
<b>Z8</b>	$X(\text{Na}_{0.37}\square_{0.63})_{\Sigma 1.00} Y(\text{Al}_{1.00}\text{Li}_{0.46}\text{Fe}^{2+}_{0.19}\text{Mn}^{2+}_{1.32}\text{Ti}_{0.01})_{\Sigma 2.98} Z\text{Al}_6[\text{T}(\text{Si}_{6.02}\text{O}_{18})](\text{BO}_3)_3^V(\text{OH})_{\Sigma 3.00} W(\text{OH}_{0.98}\text{F}_{0.02})_{\Sigma 1.00}$

**Table S2.5.** Average chemical composition and atoms per formula unit (a.p.f.u) for the different zones of San Silvestro sample (San Piero in Campo, Elba Island, Italy) with the relative empirical formula.

	Prismatic section				Termination				
	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9
	n = 6	n = 23	n = 3	n = 1	n = 1	n = 1	n = 1	n = 1	n = 2
SiO <sub>2</sub> wt%	37.88(31)	37.22(48)	38.11(9)	37.54	36.48	36.83	37.58	37.08	36.46(22)
TiO <sub>2</sub>	0.05(3)	0.14(6)	0.05(2)	0.07	0.07	0.09	0.04	0.09	0.11(2)
B <sub>2</sub> O <sub>3</sub>	11.06 <sup>a</sup>	10.86 <sup>a</sup>	11.09 <sup>a</sup>	10.88 <sup>a</sup>	10.57 <sup>a</sup>	10.63 <sup>a</sup>	10.69 <sup>a</sup>	10.79 <sup>a</sup>	10.63 <sup>a</sup>
Al <sub>2</sub> O <sub>3</sub>	41.45(90)	39.96(98)	41.59(17)	39.23	35.76	35.96	35.20	37.84	35.92(33)
FeO <sub>tot</sub>	0.17(19)	0.85(38)	0.24(13)	1.08	4.04	5.27	7.08	2.98	4.94(98)
MnO	2.44(51)	2.93(86)	1.30(64)	4.43	8.91	6.69	5.44	6.30	7.25(70)
MgO	0.01(1)	0.01	0.01(1)	-	0.06	0.11	0.11	0.18	0.44(18)
CaO	0.06(2)	0.13(8)	0.04(2)	0.06	0.02	0.03	0.02	0.12	0.04(2)
Na <sub>2</sub> O	1.89(9)	1.99(24)	1.98(8)	1.89	1.03	1.30	1.06	1.47	1.23(8)
K <sub>2</sub> O	0.02(2)	0.03(2)	0.01	0.01	0.00	0.03	0.02	0.02	0.03
Li <sub>2</sub> O	1.61 <sup>b</sup>	1.51 <sup>b</sup>	1.80 <sup>b</sup>	1.35 <sup>b</sup>	0.39 <sup>b</sup>	0.55 <sup>b</sup>	0.61 <sup>b</sup>	0.82 <sup>b</sup>	0.48 <sup>b</sup>
F	0.73(15)	0.62(22)	0.22(15)	0.29	0.03	0.00	0.20	0.23	0.10(3)
H <sub>2</sub> O	3.29 <sup>a</sup>	3.27 <sup>a</sup>	3.60 <sup>a</sup>	3.47 <sup>a</sup>	3.62 <sup>a</sup>	3.61 <sup>a</sup>	3.62 <sup>a</sup>	3.50 <sup>a</sup>	3.64 <sup>a</sup>
-O ≡ F	-0.31	-0.26	-0.09	-0.12	-0.01	-	-0.08	-0.10	-0.04
FeO	0.17	0.85	0.24	1.08	4.04	5.27	6.72 <sup>c</sup>	2.98	4.94
Fe <sub>2</sub> O <sub>3</sub>	-	-	-	-	-	-	0.35 <sup>c</sup>	-	-
Total	100.40	99.28	99.97	100.23	100.99	101.08	101.57	101.33	101.26

**Atoms normalized to 31 anions**

Si apfu	5.952	5.958	5.972	5.996	5.996	6.023	6.113	5.972	5.962
Ti	0.006	0.017	0.006	0.008	0.009	0.011	0.005	0.011	0.013
B	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000
Al	7.674	7.538	7.681	7.385	6.927	6.932	6.749	7.182	6.922
Fe <sup>3+</sup>	-	-	-	-	-	-	0.043	-	-
Fe <sup>2+</sup>	0.023	0.114	0.031	0.145	0.555	0.720	0.915	0.401	0.676
Mn <sup>2+</sup>	0.325	0.398	0.173	0.599	1.241	0.927	0.749	0.860	1.003
Mg	0.001	0.001	0.001	-	0.015	0.027	0.027	0.043	0.107
Ca	0.009	0.022	0.007	0.011	0.004	0.005	0.003	0.021	0.007
Na	0.575	0.619	0.602	0.585	0.329	0.362	0.335	0.458	0.391
K	0.005	0.005	0.002	0.001	0.000	0.006	0.003	0.005	0.005
Li	1.017	0.972	1.135	0.867	0.258	0.362	0.399	0.531	0.316
F	0.362	0.313	0.109	0.147	0.016	0.000	0.102	0.119	0.050
OH	3.452	3.496	3.764	3.699	3.965	3.938	3.952	3.760	3.974
OH+F	3.814	3.809	3.873	3.846	3.980	3.938	4.027	3.879	4.024

Species	Elbaite	Elbaite	Elbaite	Elbaite	Cellerite	Cellerite	Foite	Cellerite	Cellerite
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<sup>a</sup> Calculated by stoichiometry (see text);

<sup>b</sup> Estimated with the procedure of Pesquera et al. (2016);

<sup>c</sup> Determined by Mössbauer spectroscopy.

Errors for oxides and fluorine are standard deviations (in brackets)

**Empirical chemical formulae**

<b>Z1</b>	$X(\text{Na}_{0.58} \square_{0.41} \text{Ca}_{0.01})_{\Sigma 1.00} Y(\text{Al}_{1.62} \text{Li}_{1.02} \text{Fe}^{2+}_{0.02} \text{Mn}^{2+}_{0.32} \text{Ti}_{0.01})_{\Sigma 3.00} Z\text{Al}_6[\text{T}(\text{Si}_{5.95} \text{Al}_{0.05})\text{O}_{18}](\text{BO}_3)_3^V(\text{OH})_{\Sigma 3.00} W(\text{OH}_{0.45} \text{F}_{0.36} \text{O}_{0.19})_{\Sigma 1.00}$
<b>Z2</b>	$X(\text{Na}_{0.62} \square_{0.36} \text{Ca}_{0.02})_{\Sigma 1.00} Y(\text{Al}_{1.50} \text{Li}_{0.97} \text{Fe}^{2+}_{0.11} \text{Mn}^{2+}_{0.40} \text{Ti}_{0.02})_{\Sigma 3.00} Z\text{Al}_6[\text{T}(\text{Si}_{5.96} \text{Al}_{0.04})\text{O}_{18}](\text{BO}_3)_3^V(\text{OH})_{\Sigma 3.00} W(\text{OH}_{0.50} \text{F}_{0.31} \text{O}_{0.19})_{\Sigma 1.00}$
<b>Z3</b>	$X(\text{Na}_{0.60} \square_{0.39} \text{Ca}_{0.01})_{\Sigma 1.00} Y(\text{Al}_{1.65} \text{Li}_{1.14} \text{Fe}^{2+}_{0.31} \text{Mn}^{2+}_{0.17} \text{Ti}_{0.01})_{\Sigma 3.00} Z\text{Al}_6[\text{T}(\text{Si}_{5.97} \text{Al}_{0.03})\text{O}_{18}](\text{BO}_3)_3^V(\text{OH})_{\Sigma 3.00} W(\text{OH}_{0.76} \text{F}_{0.11} \text{O}_{0.13})_{\Sigma 1.00}$
<b>Z4</b>	$X(\text{Na}_{0.59} \square_{0.40} \text{Ca}_{0.01})_{\Sigma 1.00} Y(\text{Al}_{1.65} \text{Li}_{1.14} \text{Fe}^{2+}_{0.31} \text{Mn}^{2+}_{0.17} \text{Ti}_{0.01})_{\Sigma 3.00} Z\text{Al}_6[\text{T}(\text{Si}_{6.00} \text{O}_{18})](\text{BO}_3)_3^V(\text{OH})_{\Sigma 3.00} W(\text{OH}_{0.70} \text{F}_{0.15} \text{O}_{0.15})_{\Sigma 1.00}$
<b>Z5</b>	$X(\text{Na}_{0.33} \square_{0.67})_{\Sigma 1.00} Y(\text{Al}_{0.93} \text{Li}_{0.26} \text{Fe}^{2+}_{0.56} \text{Mn}^{2+}_{1.24} \text{Ti}_{0.01})_{\Sigma 3.00} Z\text{Al}_6[\text{T}(\text{Si}_{6.00} \text{O}_{18})](\text{BO}_3)_3^V(\text{OH})_{\Sigma 3.00} W(\text{OH}_{0.97} \text{F}_{0.02} \text{O}_{0.01})_{\Sigma 1.00}$
<b>Z6</b>	$X(\text{Na}_{0.36} \square_{0.64})_{\Sigma 1.00} Y(\text{Al}_{0.93} \text{Li}_{0.36} \text{Fe}^{2+}_{0.72} \text{Mn}^{2+}_{0.93} \text{Ti}_{0.01})_{\Sigma 2.98} Z\text{Al}_6[\text{T}(\text{Si}_{6.02} \text{O}_{18})](\text{BO}_3)_3^V(\text{OH})_{\Sigma 3.00} W(\text{OH}_{0.94} \text{O}_{0.06})_{\Sigma 1.00}$
<b>Z7</b>	$X(\text{Na}_{0.34} \square_{0.66})_{\Sigma 1.00} Y(\text{Al}_{0.75} \text{Li}_{0.40} \text{Fe}^{2+}_{0.92} \text{Fe}^{3+}_{0.04} \text{Mn}^{2+}_{0.75} \text{Ti}_{0.01})_{\Sigma 2.89} Z\text{Al}_6[\text{T}(\text{Si}_{6.11} \text{O}_{18})](\text{BO}_3)_3^V(\text{OH})_{\Sigma 3.00} W(\text{OH}_{0.95} \text{F}_{0.05})_{\Sigma 1.00}$
<b>Z8</b>	$X(\text{Na}_{0.46} \square_{0.52} \text{Ca}_{0.02})_{\Sigma 1.00} Y(\text{Al}_{1.15} \text{Li}_{0.53} \text{Fe}^{2+}_{0.40} \text{Mn}^{2+}_{0.86} \text{Ti}_{0.01})_{\Sigma 3.00} Z\text{Al}_6[\text{T}(\text{Si}_{5.97} \text{Al}_{0.03})\text{O}_{18}](\text{BO}_3)_3^V(\text{OH})_{\Sigma 3.00} W(\text{OH}_{0.76} \text{F}_{0.12} \text{O}_{0.12})_{\Sigma 1.00}$
<b>Z9</b>	$X(\text{Na}_{0.39} \square_{0.60} \text{Ca}_{0.01})_{\Sigma 1.00} Y(\text{Al}_{0.88} \text{Li}_{0.32} \text{Fe}^{2+}_{0.68} \text{Mn}^{2+}_{1.00} \text{Ti}_{0.01})_{\Sigma 3.00} Z\text{Al}_6[\text{T}(\text{Si}_{5.96} \text{Al}_{0.04})\text{O}_{18}](\text{BO}_3)_3^V(\text{OH})_{\Sigma 3.00} W(\text{OH}_{0.97} \text{F}_{0.03})_{\Sigma 1.00}$

**Table S2.6.** Average chemical composition and atoms per formula unit (a.p.f.u) for the different zones of Testa Rossa sample (San Piero in Campo, Elba Island, Italy) with the relative empirical formula.

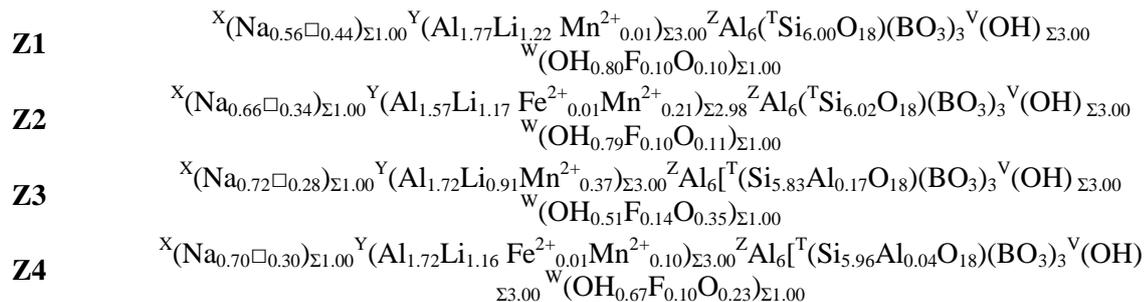
	Prismatic section		Termination	
	Z1	Z2	Z3	Z4
	n = 11	n = 6	n = 1	n = 2
SiO <sub>2</sub> wt%	39.35(52)	38.97(36)	35.65	38.03(31)
TiO <sub>2</sub>	-	0.03(3)	0.01	-
B <sub>2</sub> O <sub>3</sub>	11.40 <sup>a</sup>	11.26 <sup>a</sup>	10.63 <sup>a</sup>	11.10 <sup>a</sup>
Al <sub>2</sub> O <sub>3</sub>	43.22(29)	41.59(45)	40.92	42.13(20)
FeO <sub>tot</sub>	0.03(2)	0.08(9)	0.02	0.06(2)
MnO	0.06(3)	1.64(91)	2.66	0.78(10)
ZnO	-	0.06(4)	-	-
MgO	-	0.05(10)	-	0.01
CaO	0.01(1)	0.01(3)	0.01	0.01
Na <sub>2</sub> O	1.89(9)	2.21(4)	2.26	2.30(1)
Li <sub>2</sub> O	1.99 <sup>b</sup>	1.88 <sup>b</sup>	1.39 <sup>b</sup>	1.84 <sup>b</sup>
F	0.20(8)	0.20(9)	0.28	0.21(11)
-O ≡ F	-0.08	-0.08	-0.12	-0.09
H <sub>2</sub> O	3.74 <sup>a</sup>	3.68 <sup>a</sup>	3.22 <sup>a</sup>	3.52 <sup>a</sup>
Total	101.78	101.58	96.88	99.92
<b>Atoms normalized to 31 anions</b>				
Si apfu	6.000	6.017	5.830	5.955
Ti	-	0.003	0.001	-
B	3.000	3.000	3.000	3.000
Al	7.767	7.569	7.887	7.775
Fe <sup>2+</sup>	0.004	0.010	0.003	0.008
Mn <sup>2+</sup>	0.008	0.214	0.369	0.103
Zn	-	0.007	-	-
Mg	-	0.012	-	0.001
Ca	0.001	0.001	0.001	0.001
Na	0.558	0.661	0.715	0.697
Li	1.221	1.168	0.914	1.159
F	0.095	0.096	0.143	0.102
OH	3.801	3.792	3.509	3.673
OH+F	3.895	3.888	3.652	3.775
<b>Species</b>	<b>Elbaite</b>	<b>Elbaite</b>	<b>Elbaite</b>	<b>Elbaite</b>

<sup>a</sup> Calculated by stoichiometry (see text)

<sup>b</sup> Estimated with the procedure of Pesquera et al. (2016)

Errors for oxides and fluorine are standard deviations (in brackets)

### Empirical chemical formulae



**Table S2.7.** Average chemical composition and atoms per formula unit (a.p.f.u) for the different zones of Testa Scura sample (San Piero in Campo, Elba Island, Italy) with the relative empirical formula.

	Prismatic section			Termination					
	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9
	n = 10	n = 2	n = 1	n = 7	n = 3	n = 2	n = 1	n = 3	n = 1
SiO <sub>2</sub> wt%	37.89(54)	37.53(5)	36.95	36.80(11)	37.58(25)	37.10(23)	37.51	36.99(27)	36.29
TiO <sub>2</sub>	0.15(3)	0.26(1)	0.24	0.13(3)	0.0682)	0.10(1)	0.04	0.03(1)	0.07
B <sub>2</sub> O <sub>3</sub>	11.05 <sup>a</sup>	10.82 <sup>a</sup>	10.67 <sup>a</sup>	10.69 <sup>a</sup>	10.88 <sup>a</sup>	10.76 <sup>a</sup>	10.96 <sup>a</sup>	10.76 <sup>a</sup>	10.63 <sup>a</sup>
Al <sub>2</sub> O <sub>3</sub>	40.83(79)	37.50(32)	36.16	36.19(23)	38.84(56)	36.90(72)	39.06	37.14(66)	35.95
FeO <sub>tot</sub>	0.28(31)	2.35(42)	3.41	2.08(83)	0.72(14)	2.27(48)	0.98	1.62(74)	2.30
MnO	3.65(82)	6.04(73)	8.02	11.08(68)	6.80(78)	9.20(20)	8.49	10.01(10)	11.12
ZnO	0.02(4)	0.06(4)	-	0.05(5)	0.07(5)	0.05(2)	-	-	0.13
MgO	-	0.01(1)	0.01	0.03(1)	0.03(1)	0.07(2)	0.03	0.07(3)	0.30
CaO	0.08(2)	0.08(1)	0.05	0.02(1)	0.01(1)	0.03(3)	-	-	-
Na <sub>2</sub> O	1.89(11)	2.13(6)	1.93	1.32(6)	1.06(88)	1.30(5)	1.17	1.10(7)	1.31
K <sub>2</sub> O	-	0.01(1)	0.02	0.02(1)	0.02(1)	0.03(1)	0.03	0.02	0.00
Li <sub>2</sub> O	1.47 <sup>b</sup>	1.08 <sup>b</sup>	0.66 <sup>b</sup>	0.38 <sup>b</sup>	1.01 <sup>b</sup>	0.60 <sup>b</sup>	0.73 <sup>b</sup>	0.54 <sup>b</sup>	0.29 <sup>b</sup>
F	0.76(32)	1.16(13)	0.72	0.34(14)	0.22(4)	0.10(1)	0.00	0.03(3)	0.00
-O ≡ F	-0.32	-0.49	-0.30	-0.14	-0.09	-0.04	-0.00	-0.01	-0.00
H <sub>2</sub> O	3.26 <sup>a</sup>	2.99 <sup>a</sup>	3.11 <sup>a</sup>	3.43 <sup>a</sup>	3.76 <sup>a</sup>	3.61 <sup>a</sup>	3.66 <sup>a</sup>	3.68 <sup>a</sup>	3.63 <sup>a</sup>
Total	100.99	101.51	101.65	102.39	100.82	102.07	102.68	102.00	102.05
Atoms normalized to 31 anions									
Si apfu	5.960	6.028	6.021	5.982	6.003	5.990	5.950	5.973	5.932
Ti	0.018	0.031	0.030	0.016	0.008	0.012	0.005	0.004	0.008
B	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000
Al	7.569	7.099	6.944	6.933	7.310	7.022	7.302	7.067	6.926
Fe <sup>2+</sup>	0.036	0.316	0.465	0.282	0.096	0.307	0.130	0.219	0.314
Mn <sup>2+</sup>	0.486	0.821	1.107	1.525	0.919	1.258	1.140	1.369	1.540
Zn	0.002	0.007	-	0.006	0.008	0.006	-	-	0.016
Mg	-	0.001	0.000	0.007	0.007	0.017	0.007	0.017	0.073
Ca	0.014	0.014	0.009	0.000	0.000	0.005	-	-	-
Na	0.577	0.665	0.609	0.415	0.329	0.408	0.360	0.344	0.415
K	0.000	0.001	0.003	0.003	0.000	0.005	0.005	0.002	-
Li	0.930	0.698	0.433	0.248	0.649	0.390	0.466	0.351	0.191
F	0.376	0.590	0.370	0.175	0.110	0.051	0.000	0.017	-
OH	3.423	3.198	3.377	3.722	3.879	3.890	3.878	3.959	3.963
OH+F	3.799	3.788	3.747	3.897	3.989	3.941	3.878	3.976	3.963
Species	Elbaite	Fluor-elbaite	Tsilaisite	Celleriite	Rossmannite	Celleriite	Celleriite	Celleriite	Celleriite

<sup>a</sup> Calculated by stoichiometry (see text);

<sup>b</sup> Estimated with the procedure of Pesquera et al. (2016)

Errors for oxides and fluorine are standard deviations (in brackets)

### Empirical chemical formulae



**Table S2.8.** Average chemical composition and atoms per formula unit (a.p.f.u) for the different zones of Testa Viola sample (San Piero in Campo, Elba Island, Italy) with the relative empirical formula.

	Prismatic section			Termination	
	Z1	Z2	Z3	Z4	Z5
	<i>n</i> = 4	<i>n</i> = 1	<i>n</i> = 1	<i>n</i> = 4	<i>n</i> = 12
SiO <sub>2</sub> wt%	38.08(91)	39.46	37.01	38.78(29)	37.80(40)
TiO <sub>2</sub>	0.02(2)	0.02	-	0.03(1)	0.04(2)
B <sub>2</sub> O <sub>3</sub>	11.11 <sup>a</sup>	11.40 <sup>a</sup>	10.94 <sup>a</sup>	11.16 <sup>a</sup>	10.99 <sup>a</sup>
Al <sub>2</sub> O <sub>3</sub>	42.42(72)	42.97	42.55	40.83(55)	40.39(92)
FeO <sub>tot</sub>	0.04(3)	0.01	0.04	0.32(13)	0.52(28)
MnO	0.10(10)	0.04	0.03	1.87(76)	3.28(87)
ZnO	0.01(1)	0.03	0.01	0.05	0.04(4)
CaO	0.12(13)	0.02	0.01	0.01(1)	0.03(2)
Na <sub>2</sub> O	1.96(6)	2.07	2.07	2.24(3)	2.21(12)
Li <sub>2</sub> O	1.92 <sup>b</sup>	2.04 <sup>b</sup>	1.78 <sup>b</sup>	1.86 <sup>b</sup>	1.53 <sup>b</sup>
F	0.43(32)	0.22	0.12	0.13(7)	0.20(12)
-O ≡ F	-0.18	-0.09	-0.05	-0.05	-0.08
H <sub>2</sub> O	3.47 <sup>a</sup>	3.69 <sup>a</sup>	3.48 <sup>a</sup>	3.69 <sup>a</sup>	3.49 <sup>a</sup>
Total	99.52	101.86	98.01	100.93	100.44

**Atoms normalized to 31 anions**

Si apfu	5.956	6.018	5.882	6.041	5.980
Ti	0.002	0.002	-	0.003	0.005
B	3.000	3.000	3.000	3.000	3.000
Al	7.818	7.723	7.970	7.497	7.530
Fe <sup>2+</sup>	0.005	0.001	0.006	0.042	0.069
Mn <sup>2+</sup>	0.013	0.005	0.004	0.246	0.439
Zn	0.002	0.003	0.001	0.005	0.004
Ca	0.020	0.003	0.001	-	0.006
Na	0.594	0.612	0.639	0.677	0.677
Li	1.208	1.251	1.138	1.165	0.973
F	0.210	0.104	0.061	0.062	0.100
OH	3.622	3.759	3.695	3.834	3.687
OH+F	3.832	3.863	3.755	3.895	3.787

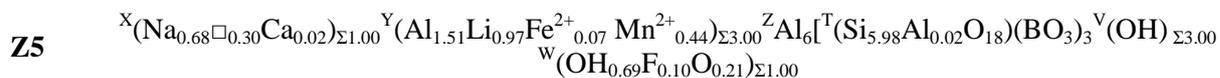
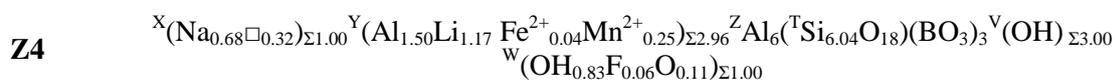
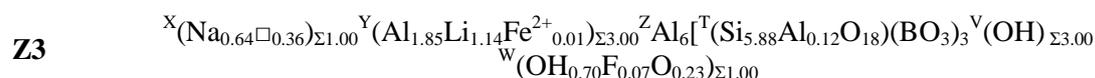
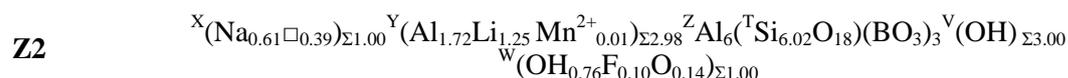
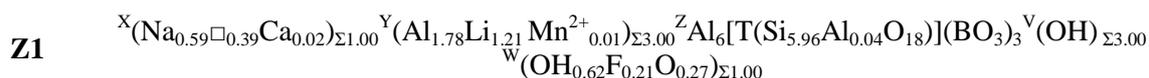
Species	Elbaite	Elbaite	Elbaite	Elbaite	Elbaite
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<sup>a</sup> Calculated by stoichiometry (see text)

<sup>b</sup> Estimated with the procedure of Pesquera et al. (2016)

Errors for oxides and fluorine are standard deviations (in brackets)

**Empirical chemical formulae**



**Table S2.9.** Average chemical composition and atoms per formula unit (a.p.f.u) for the different zones of the prismatic section of fragment I and OGX of Violet Cap sample (San Piero in Campo, Elba Island, Italy) with the relative empirical formula.

Fragment I					
	Prismatic section I	OGX			
	Z1	Z2	Z3	Z4	Z5
	n = 12	n = 3	n = 2	n = 3	n = 1
SiO <sub>2</sub> wt%	37.95(20)	37.75(41)	38.12(12)	38.01(3)	35.93
TiO <sub>2</sub>	0.05(2)	0.14(7)	0.06(4)	0.06(4)	0.01
B <sub>2</sub> O <sub>3</sub>	11.06 <sup>a</sup>	10.89 <sup>a</sup>	11.06 <sup>a</sup>	10.97 <sup>a</sup>	10.77 <sup>a</sup>
Al <sub>2</sub> O <sub>3</sub>	41.77(33)	39.11(39)	41.30(61)	39.98(21)	42.60
FeO <sub>tot</sub>	0.03(3)	0.13(6)	0.05(2)	0.07(2)	-
MnO <sub>tot</sub>	0.62(51)	4.00(40)	0.93(26)	2.72(52)	0.72
CaO	0.34(7)	0.06(4)	0.03	0.07(1)	0.06
Na <sub>2</sub> O	1.85(4)	2.36(3)	2.18(16)	2.31(11)	2.25
K <sub>2</sub> O	0.01(1)	0.01(1)	0.02(1)	0.01(2)	-
Li <sub>2</sub> O	1.90 <sup>b</sup>	1.63 <sup>b</sup>	1.93 <sup>b</sup>	1.78 <sup>b</sup>	1.54 <sup>b</sup>
F	0.99(9)	0.73(17)	0.49(28)	0.41(14)	0.13
-O ≡ F	-0.42	-0.31	-0.21	-0.17	-0.05
H <sub>2</sub> O	3.18 <sup>a</sup>	3.10 <sup>a</sup>	3.43 <sup>a</sup>	3.34 <sup>a</sup>	3.22 <sup>a</sup>
MnO <sup>d</sup>	0.62	2.85	0.60	1.75	0.458
Mn <sub>2</sub> O <sub>3</sub> <sup>d</sup>	-	1.28	0.37	1.08	0.290
Total	99.35	99.66	99.41	99.59	97.19
Atoms normalized to 31 anions					
Si apfu	5.967	6.024	5.992	6.021	5.799
Ti	0.006	0.017	0.007	0.007	0.001
B	3.000	3.000	3.000	3.000	3.000
Al	7.740	7.355	7.651	7.464	8.102
Fe <sup>3+</sup>	-	0.017	0.006	0.009	-
Fe <sup>2+</sup>	0.003	-	-	-	-
Mn <sup>3+</sup>	-	0.155	0.044	0.130	0.036
Mn <sup>2+</sup>	0.083	0.385	0.080	0.235	0.063
Ca	0.057	0.010	0.005	0.013	0.011
Na	0.563	0.732	0.664	0.708	0.704
K	0.002	0.003	0.005	0.003	-
Li	1.201	1.046	1.220	1.134	1.000
F	0.494	0.370	0.243	0.205	0.067
OH	3.334	3.301	3.595	3.529	3.505
OH+F	3.828	3.671	3.838	3.734	3.572
Species	Fluor-elbaite	Elbaite	Elbaite	Elbaite	Elbaite

<sup>a</sup> Calculated by stoichiometry (see text);

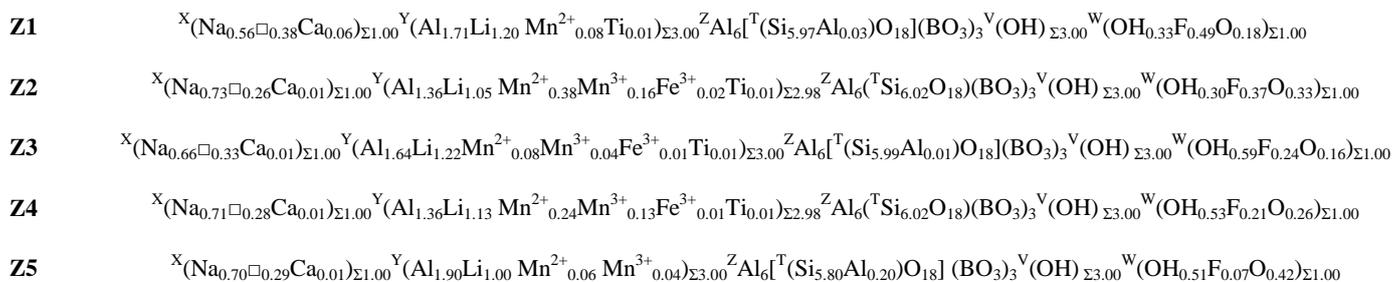
<sup>b</sup> Estimated with the procedure of Pesquera et al. (2016);

<sup>c</sup> Determined by Mössbauer spectroscopy

<sup>d</sup> Determined by OAS (Altieri et al., 2022b)

Errors for oxides and fluorine are standard deviations (in brackets)

### Empirical chemical formulae



**Table S2.10.** Average chemical composition and atoms per formula unit (a.p.f.u) for the different zones of OGR and the prismatic section of fragment II of Violet Cap sample (San Piero in Campo, Elba Island, Italy) with the relative empirical formula.

Fragment II							
	OGR		Prismatic section II		OGZ		
	Z6	Z7	Z8	Z9	Z10	Z11	Z12
	<i>n</i> = 3	<i>n</i> = 1	<i>n</i> = 17	<i>n</i> = 30	<i>n</i> = 1	<i>n</i> = 1	<i>n</i> = 1
SiO <sub>2</sub> wt%	37.14(31)	36.77	36.81(20)	38.23(95)	37.29	37.68	35.79
TiO <sub>2</sub>	0.26(11)	0.20	0.03	0.01	0.12	0.02	-
B <sub>2</sub> O <sub>3</sub>	10.67 <sup>a</sup>	10.76 <sup>a</sup>	10.85 <sup>a</sup>	11.16 <sup>a</sup>	10.79 <sup>a</sup>	10.95 <sup>a</sup>	10.74 <sup>a</sup>
Al <sub>2</sub> O <sub>3</sub>	36.66(39)	39.93	41.79(45)	42.64(58)	38.25	40.42	42.52
FeO <sub>tot</sub>	0.23(25)	0.08	0.02	0.02(2)	0.37	0.23	0.03
MnO	6.77(47)	2.47	0.29(11)	0.08(5)	5.86	2.76	0.68
CaO	0.24(10)	0.11	0.19(13)	0.02(3)	0.02	0.01	0.06
Na <sub>2</sub> O	2.73(13)	2.27	1.87	1.86(11)	2.42	2.55	2.18
K <sub>2</sub> O	0.02(1)	0.02	0.01	0.01(1)	0.03	0.05	-
Li <sub>2</sub> O	1.39 <sup>b</sup>	1.67 <sup>b</sup>	1.81 <sup>b</sup>	1.92 <sup>b</sup>	1.34 <sup>b</sup>	1.65 <sup>b</sup>	1.53 <sup>b</sup>
F	1.30(17)	0.80	0.75(18)	0.31(16)	-	-	-
-O ≡ F	-0.55	-0.34	-0.31	-0.13	-0.00	-0.00	-0.00
H <sub>2</sub> O	2.84 <sup>a</sup>	3.15 <sup>a</sup>	3.22 <sup>a</sup>	3.60 <sup>a</sup>	3.29 <sup>a</sup>	3.40 <sup>a</sup>	3.30 <sup>a</sup>
MnO <sup>d</sup>	6.77	2.47	0.29	0.08	4.27	2.01	0.49
Mn <sub>2</sub> O <sub>3</sub> <sup>d</sup>	-	-	-	-	1.77	0.83	0.21
Total	99.69	97.88	97.33	99.72	99.81	99.84	96.85
Atoms normalized to 31 anions							
Si apfu	6.052	5.939	5.897	5.955	6.007	5.981	5.794
Ti	0.032	0.025	0.004	0.001	0.015	0.003	-
B	3.000	3.000	3.000	3.000	3.000	3.000	3.000
Al	7.040	7.602	7.891	7.828	7.261	7.561	8.113
Fe <sup>3+</sup>	-	-	-	-	0.049	0.031	0.004
Fe <sup>2+</sup>	0.031	0.010	0.003	0.002	-	-	-
Mn <sup>3+</sup>	-	-	-	-	0.217	0.100	0.026
Mn <sup>2+</sup>	0.934	0.339	0.039	0.010	0.583	0.271	0.068
Ca	0.041	0.018	0.033	0.003	0.003	0.002	0.011
Na	0.862	0.711	0.582	0.563	0.755	0.786	0.683
K	0.003	0.004	0.002	0.003	0.006	0.010	-
Li	0.911	1.085	1.166	1.203	0.868	1.053	0.996
F	0.669	0.408	0.378	0.154	-	-	-
OH	3.086	3.396	3.445	3.736	3.531	3.595	3.521
OH+F	3.755	3.804	3.823	3.890	3.531	3.595	3.521
Species	Fluor-elbaite	Fluor-elbaite	Elbaite	Elbaite	Elbaite	Elbaite	Elbaite

<sup>a</sup> Calculated by stoichiometry (see text);

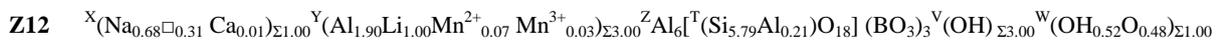
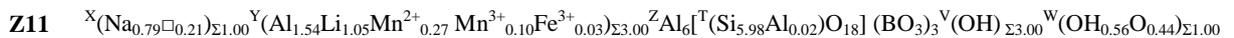
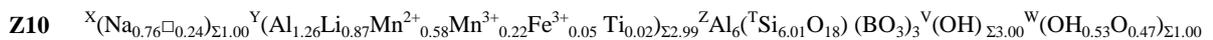
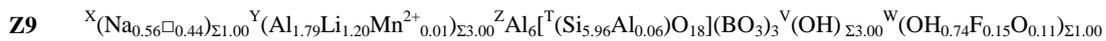
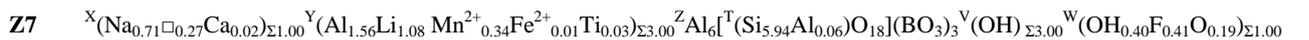
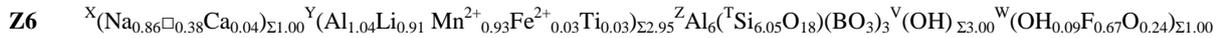
<sup>b</sup> Estimated with the procedure of Pesquera et al. (2016);

<sup>c</sup> Determined by Mössbauer spectroscopy

<sup>d</sup> Determined by OAS (Altieri et al., 2022b)

Errors for oxides and fluorine are standard deviations (in brackets)

### Empirical chemical formulae



**Table S2.11.** Average chemical composition and atoms per formula unit (a.p.f.u) for the different zones of the lateral overgrowth (OGY) of Violet Cap sample (San Piero in Campo, Elba Island, Italy) with the relative empirical formula.

<b>Fragment II</b>						
<b>OGY</b>						
	<b>Z13</b>	<b>Z14</b>	<b>Z15</b>	<b>Z16</b>	<b>Z17</b>	<b>Z18</b>
	<i>n</i> = 1	<i>n</i> = 1	<i>n</i> = 1	<i>n</i> = 2	<i>n</i> = 2	<i>n</i> = 2
SiO <sub>2</sub> wt%	37.32	37.77	38.06	38.02(22)	37.03(93)	35.56(52)
TiO <sub>2</sub>	0.07	0.07	-	0.01(1)	0.02(3)	0.01(2)
B <sub>2</sub> O <sub>3</sub>	10.78 <sup>a</sup>	10.88 <sup>a</sup>	11.00 <sup>a</sup>	10.98 <sup>a</sup>	10.87 <sup>a</sup>	10.67 <sup>a</sup>
Al <sub>2</sub> O <sub>3</sub>	37.78	38.91	40.59	39.85(15)	41.27(59)	42.21(59)
FeO <sub>tot</sub>	0.48	0.11	0.09	0.11(2)	0.03(3)	0.03(1)
MnO	7.07	4.27	1.61	3.51(12)	1.22(66)	0.62(6)
CaO	0.05	0.02	-	0.01	0.02(2)	0.05(1)
Na <sub>2</sub> O	2.31	2.48	2.49	2.48(1)	2.42(25)	2.29(2)
K <sub>2</sub> O	0.01	0.02	0.02	-	0.01(1)	-
Li <sub>2</sub> O	1.18 <sup>b</sup>	1.62 <sup>b</sup>	1.89 <sup>b</sup>	1.66 <sup>b</sup>	1.75 <sup>b</sup>	1.55 <sup>b</sup>
F	0.15	0.14	0.08	0.08(3)	0.03(2)	0.04(5)
-O ≡ F	-0.06	-0.06	-0.03	-0.03	-0.01	-0.02
MnO <sup>d</sup>	4.71	2.85	0.10	2.34	0.81	0.23
Mn <sub>2</sub> O <sub>3</sub> <sup>d</sup>	2.62	1.58	1.07	1.30	0.45	0.42
H <sub>2</sub> O	3.38 <sup>a</sup>	3.36 <sup>a</sup>	3.54 <sup>a</sup>	3.35	3.43 <sup>a</sup>	3.26 <sup>a</sup>
Total	100.58	99.78	99.33	99.41	98.14	96.31
<b>Atoms normalized to 31 anions</b>						
Si apfu	6.017	6.033	6.013	6.020	5.923	5.791
Ti	0.008	0.008	-	0.001	0.003	0.002
B	3.000	3.000	3.000	3.000	3.000	3.000
Al	7.180	7.325	7.558	7.436	7.780	8.102
Fe <sup>3+</sup>	0.065	0.015	0.011	0.014	0.004	0.005
Fe <sup>2+</sup>	-	-	-	-	-	-
Mn <sup>3+</sup>	0.322	0.192	0.072	0.158	0.055	0.029
Mn <sup>2+</sup>	0.644	0.386	0.143	0.318	0.110	0.058
Ca	0.008	0.003	-	0.002	0.003	0.008
Na	0.721	0.768	0.762	0.762	0.751	0.723
K	0.002	0.004	0.005	0.001	0.002	-
Li	0.765	1.041	1.201	1.057	1.126	1.015
F	0.076	0.069	0.038	0.039	0.017	0.019
OH	3.521	3.581	3.727	3.673	3.659	3.537
OH+F	3.697	3.650	3.765	3.712	3.676	3.556
<b>Species</b>	<b>Elbaite</b>	<b>Elbaite</b>	<b>Elbaite</b>	<b>Elbaite</b>	<b>Elbaite</b>	<b>Elbaite</b>

<sup>a</sup> Calculated by stoichiometry (see text);

<sup>b</sup> Estimated with the procedure of Pesquera et al. (2016);

<sup>c</sup> Determined by Mössbauer spectroscopy

<sup>d</sup> Determined by OAS (Altieri et al., 20022b)

Errors for oxides and fluorine are standard deviations (in brackets)

### Empirical chemical formulae

