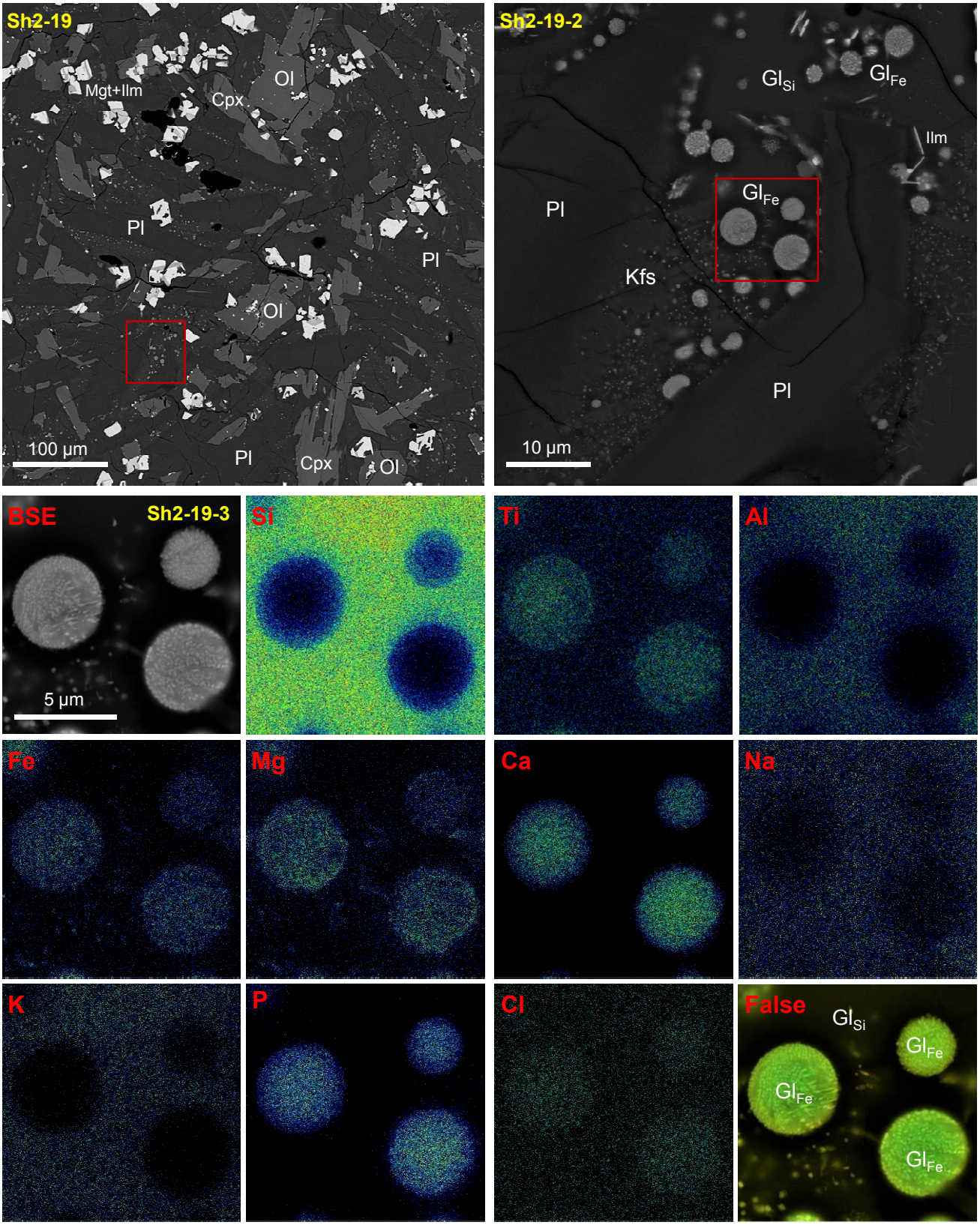

Figure S1-A. Interstitial silicate-silicate liquid immiscibility in the host rock, Duplex lava tube.

Gl_{Si} – silica-rich glass; Gl_{Fe} – globules of former Si-poor Ca-Fe-P-rich glass; Pl – plagioclase; Kfs – K-feldspar; Mgt – Ti-rich magnetite; Ilm – ilmenite or ulvospinel (in solid decay); Cpx – subcalcium diopside; Ol – olivine.

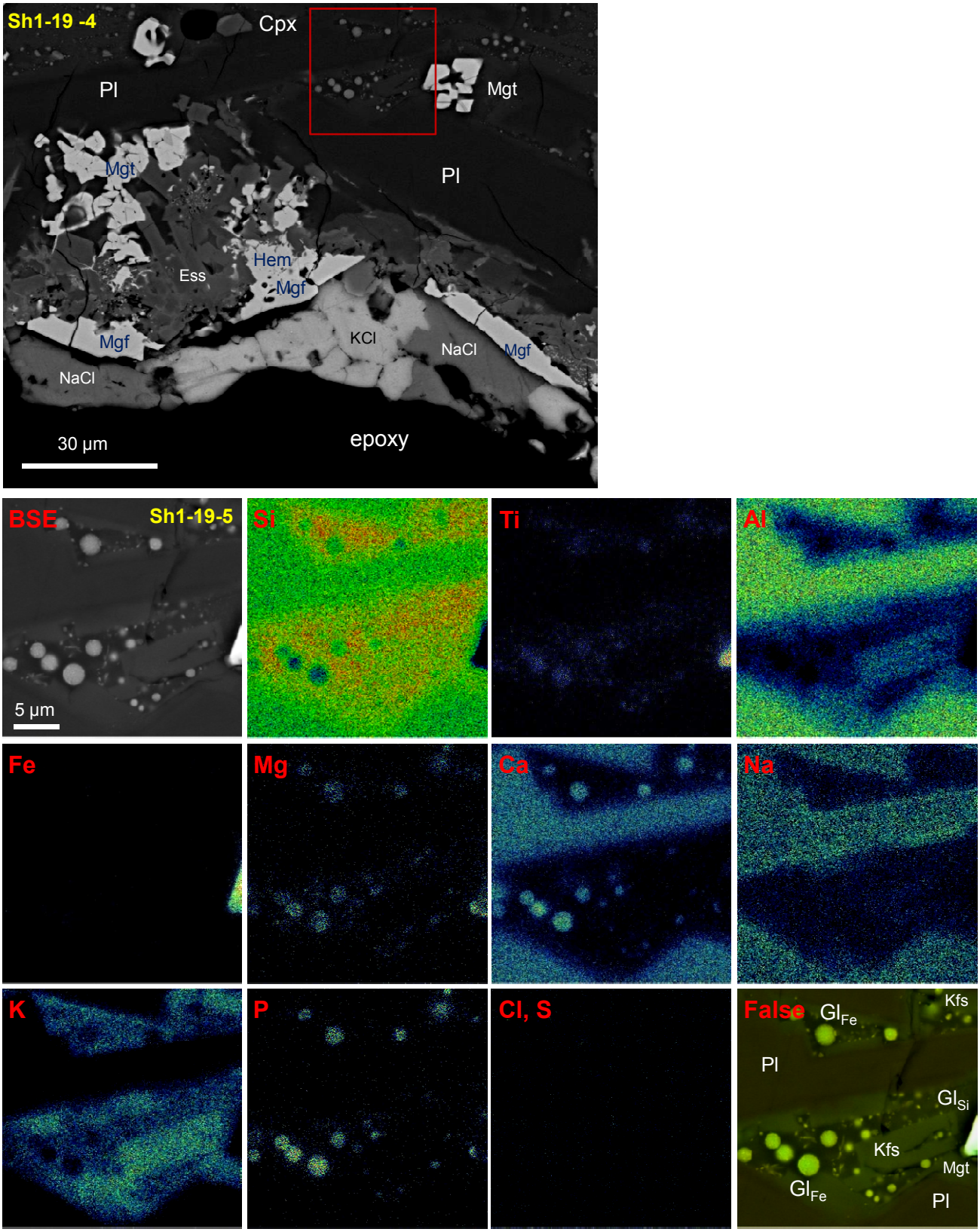

Figure S1-B. Interstitial silicate-silicate liquid immiscibility in the host rock, Duplex lava tube.

Gl_{Si} – silica-rich glass; Gl_{Fe} – globules of former Si-poor Ca-Fe-P-rich glass; Pl – plagioclase; Kfs – K-feldspar; Mgt – Ti-rich magnetite; Cpx – subcalcium diopside; Mgf – Cu-rich magnesioferrite; Hem – hematite.

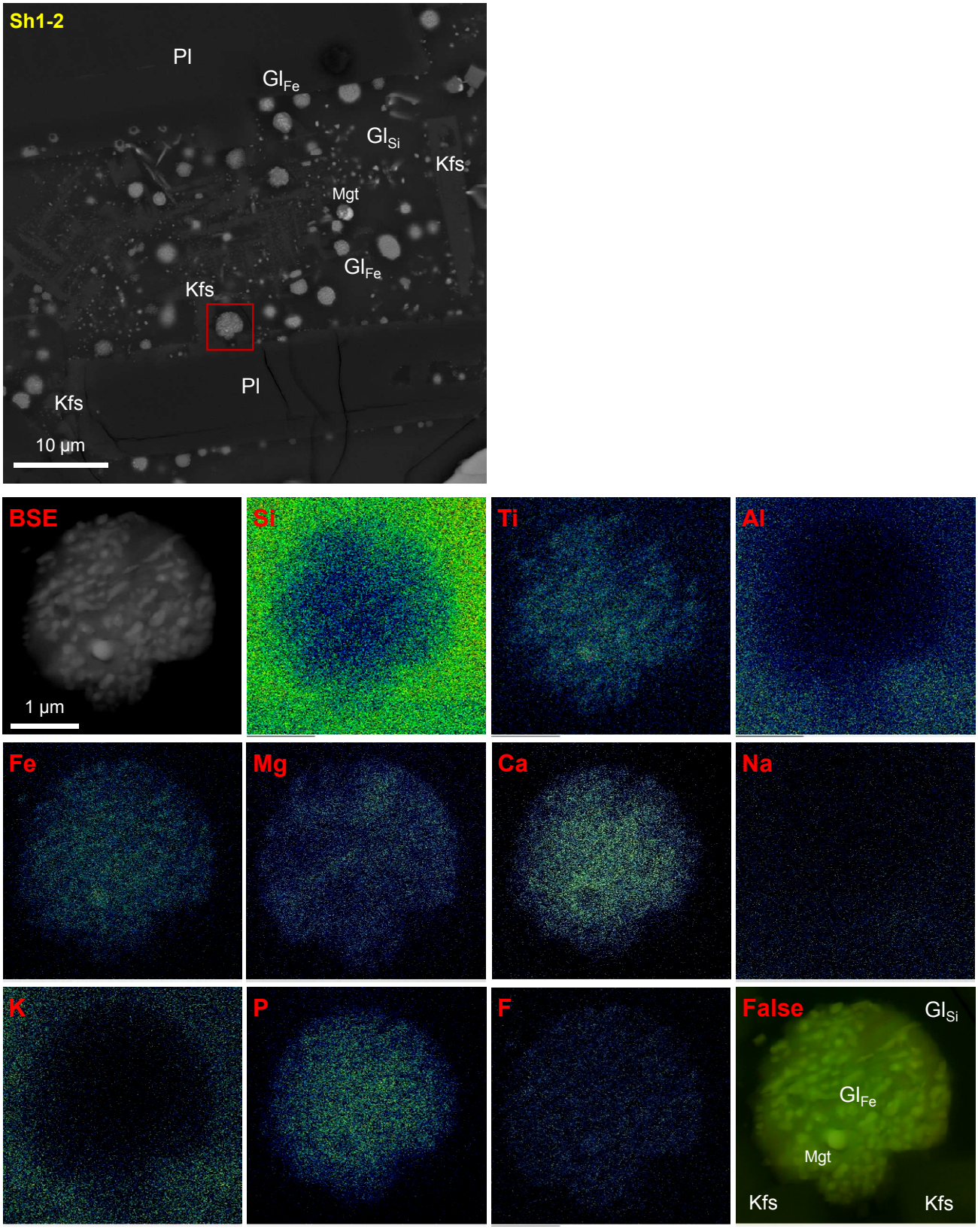

Figure S1-C. Interstitial silicate-silicate liquid immiscibility in the host rock, Duplex lava tube.

Gl_{Si} – silica-rich glass; Gl_{Fe} – globules of former Si-poor Ca-Fe-P-rich glass; Pl – plagioclase; Kfs – K-feldspar; Mgt – Ti-rich magnetite.

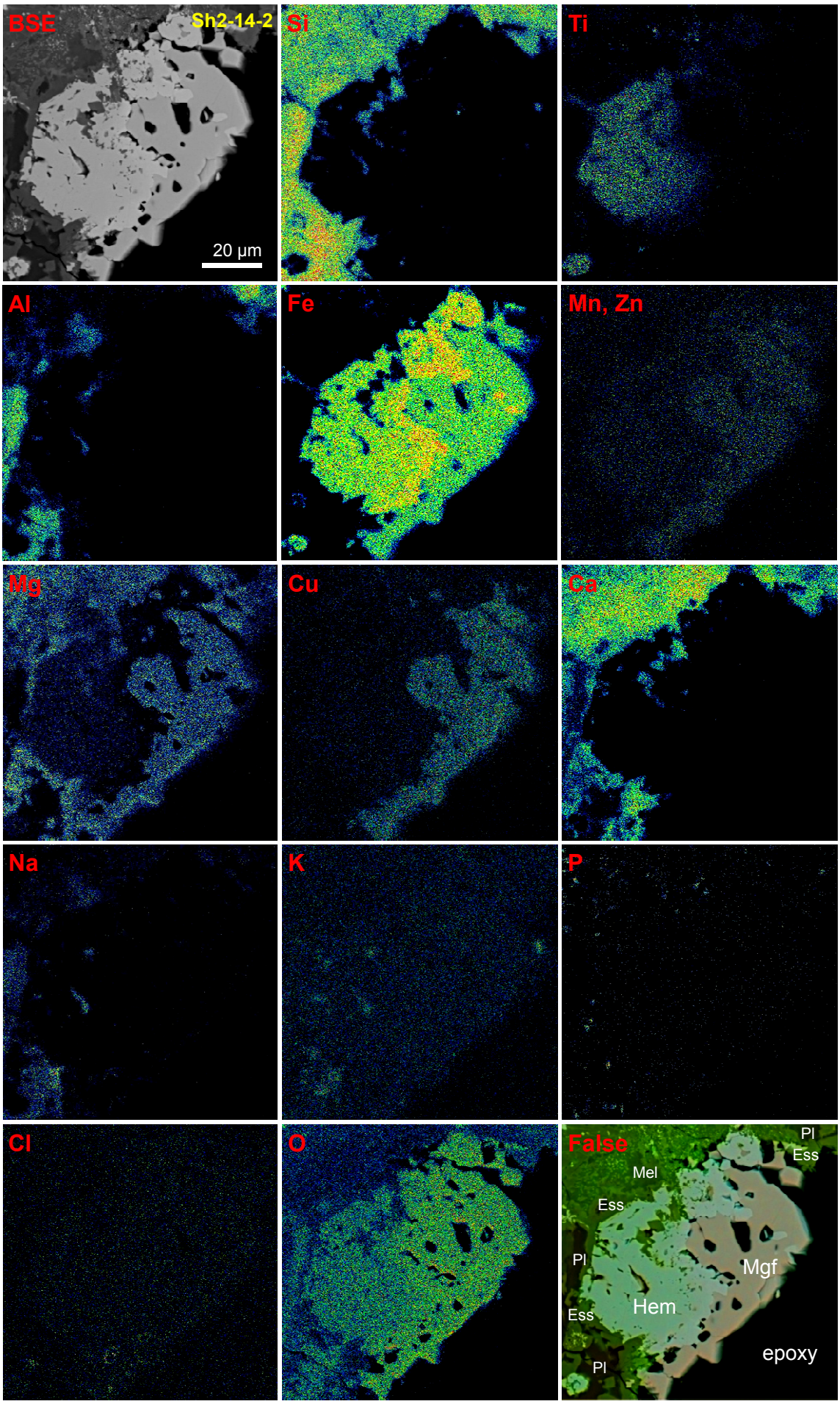

Figure S2-A. Elemental maps for individual grains of Cu-magnesioferrite in vesicles, Duplex lava tube. Mgf – Cu-magnesioferrite; Hem – hematite; Pl – plagioclase; Mel – melilite; Ess – esseneite-rich clinopyroxene.

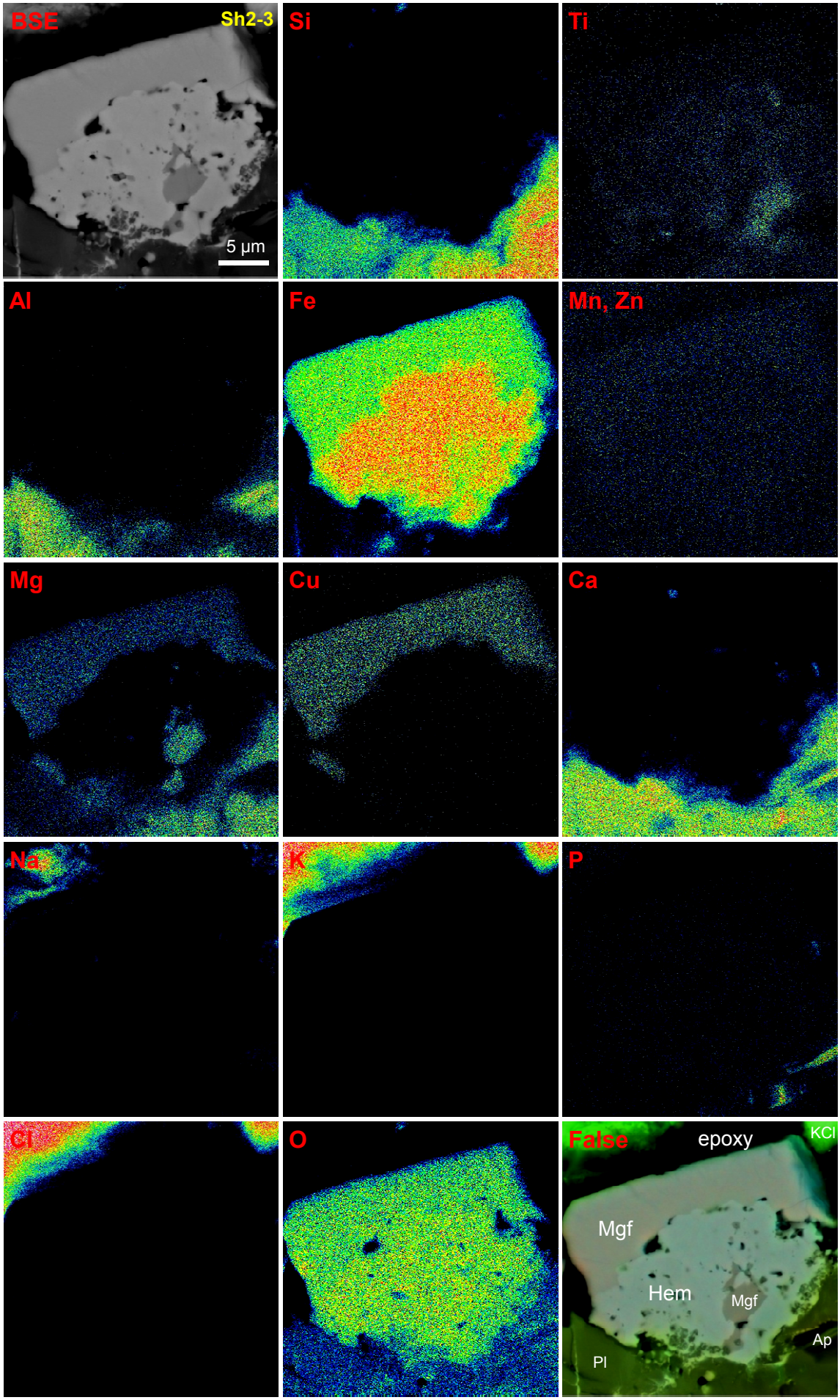

Figure S2-B. Elemental maps for individual grains of Cu-magnesioferrite in vesicles, Duplex lava tube. Mgf – Cu-magnesioferrite; Hem – hematite; Pl – plagioclase; Ap - fluorapatite.

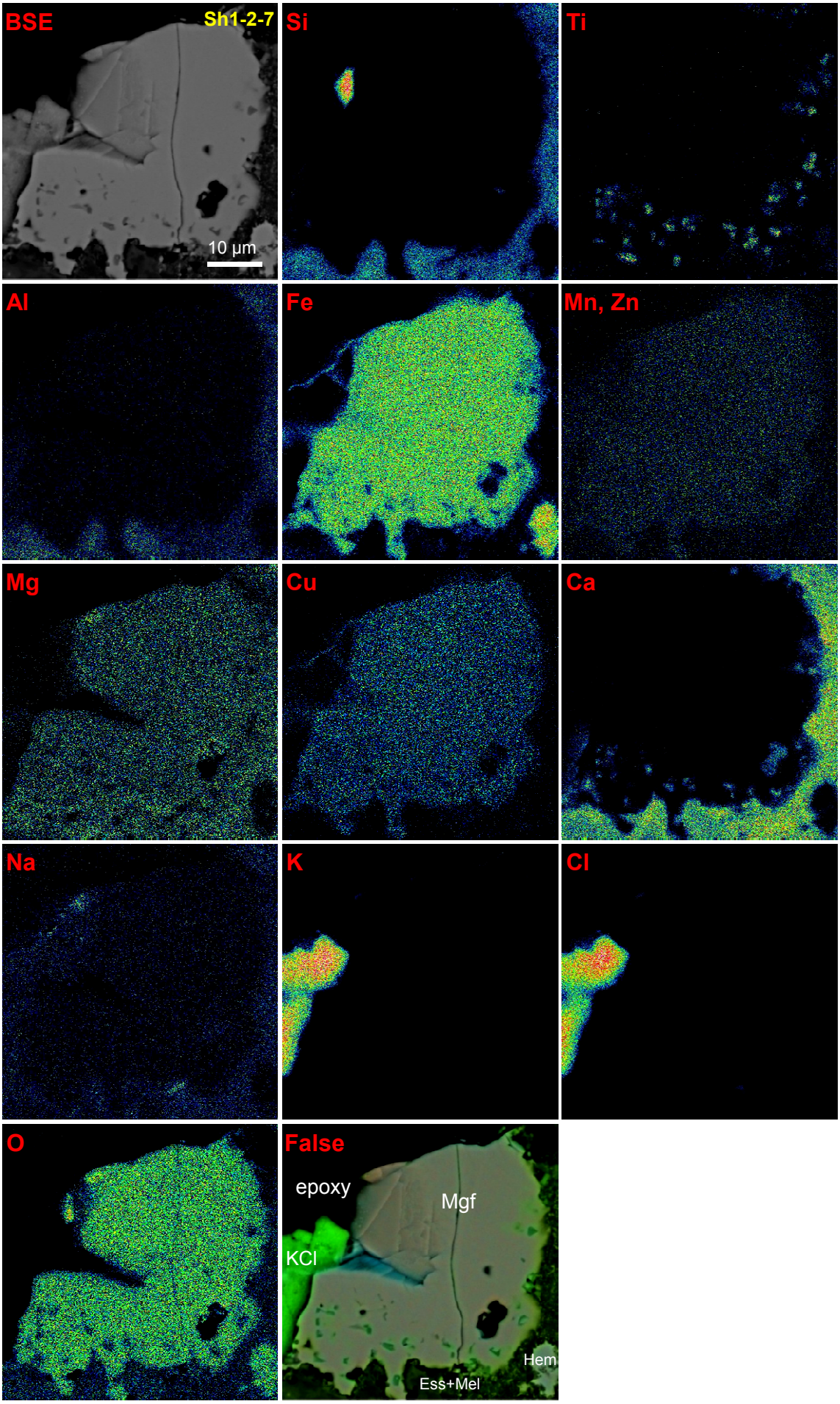

Figure S2-C. Elemental maps for individual grains of Cu-magnesioferrite in vesicles, Duplex lava tube. Mgf – Cu-magnesioferrite; Hem – hematite; Mel – melilite; Ess – esseneite-rich clinopyroxene.

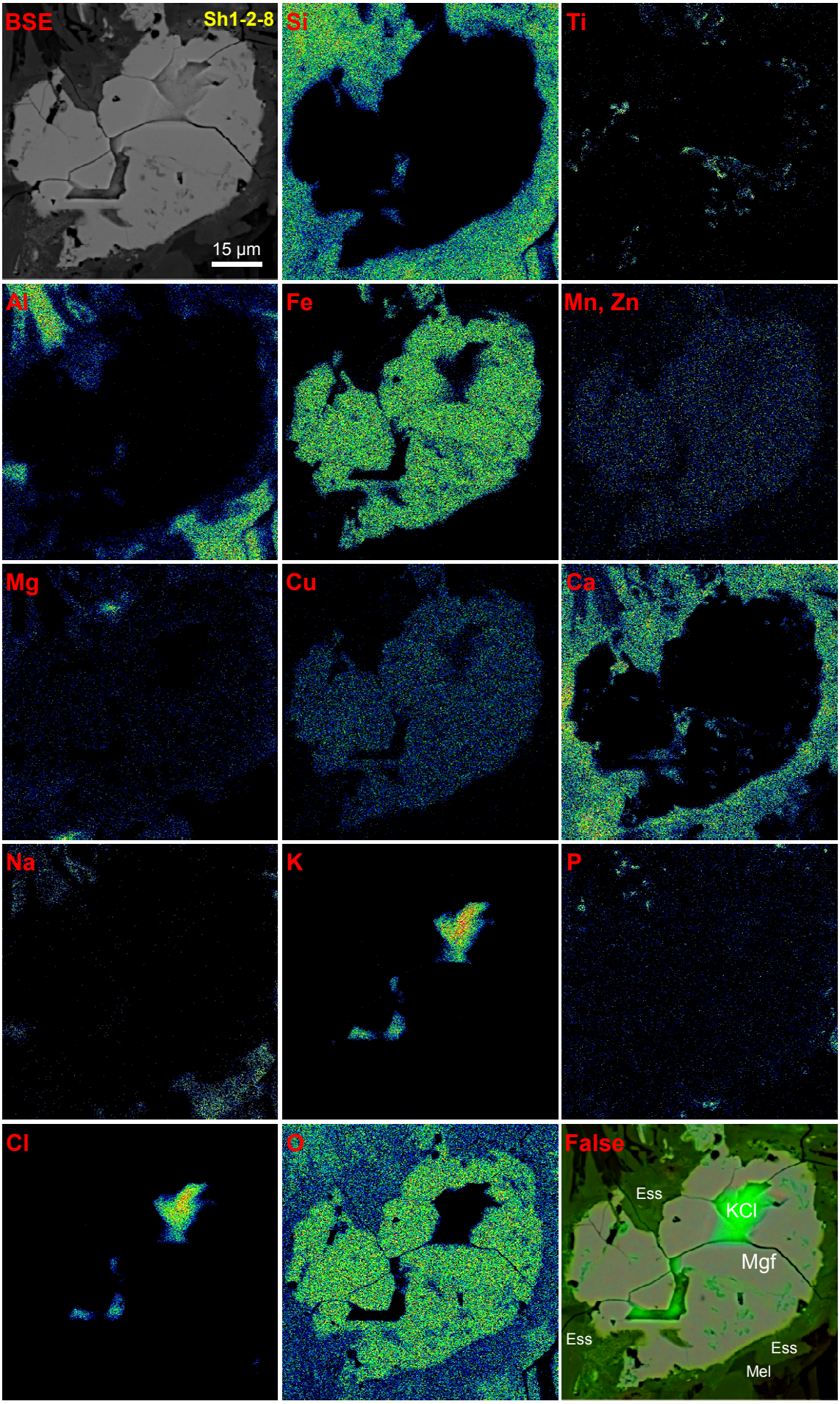

Figure S2-D. Elemental maps for individual grains of Cu-magnesioferrite in vesicles, Duplex lava tube. Mgf – Cu-magnesioferrite; Hem – hematite; Mel – melilite; Ess – esseneite-rich clinopyroxene.

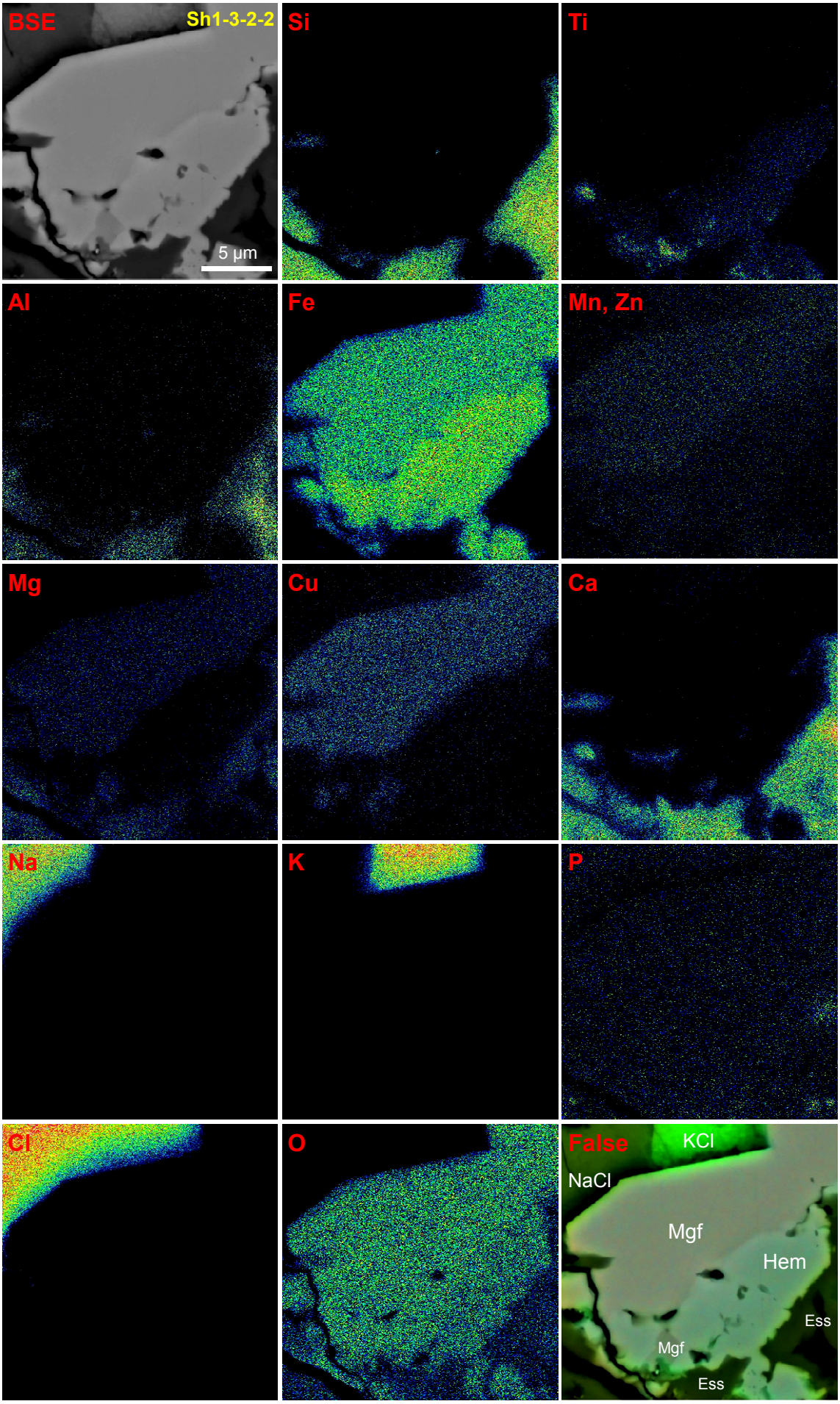

Figure S2-E. Elemental maps for individual grains of Cu-magnesioferrite in vesicles, Duplex lava tube. Mgf – Cu-magnesioferrite; Hem – hematite; Ess – esseneite-rich clinopyroxene.

Table S1. Chemical (EDS-WDS, wt.%) composition of olivine from host basaltic trachyandesite, Duplex lava tube, Tolbachik.

Sample	Sh1-1-1	Sh1-4-2	Sh1-11-1			Sh1-14-1	Sh1-16-1		Sh2-1	Sh2-1	Sh2-1		Sh2-19	Sh2-19	Sh2-19
Position	**c**	**c**	**c**	**m**	**r**	**c**	**c**	**r**	**c**	**c**	**c**	**r**	**c**	**c**	**c**
SiO_2	37.93	38.50	38.84	38.71	37.83	38.74	40.57	40.48	38.89	38.86	38.84	38.88	37.96	38.56	38.72
FeO	24.83	21.41	20.08	21.07	25.48	20.21	11.17	11.05	19.57	19.66	19.00	19.51	24.67	21.73	21.12
MnO	0.72	0.88	0.26	0.27	0.43	0.58	0.94	0.89	0.66	0.62	0.55	0.50	0.74	0.68	0.88
MgO	36.36	39.05	40.42	39.84	35.93	40.01	47.54	47.46	40.64	40.62	40.92	40.77	36.36	39.00	39.42
CaO	0.29	0.15	0.14	0.21	0.25	0.28	0.15	0.15	0.29	0.24	0.27	0.28	0.38	0.17	0.22
NiO	n.d.	n.d.	0.27	0.00	0.19	0.23	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Sum	100.13	99.99	100.01	100.10	100.11	100.05	100.37	100.03	100.05	100.00	99.58	99.94	100.11	100.14	100.36
Formula based on 4 oxygens															
Si	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Fe	0.547	0.465	0.433	0.455	0.563	0.436	0.230	0.228	0.421	0.423	0.409	0.420	0.544	0.472	0.456
Mn	0.016	0.019	0.006	0.006	0.010	0.013	0.020	0.019	0.014	0.014	0.012	0.011	0.017	0.015	0.019
Mg	1.428	1.512	1.552	1.534	1.416	1.539	1.746	1.748	1.557	1.557	1.571	1.562	1.428	1.508	1.518
Ca	0.008	0.004	0.004	0.006	0.007	0.008	0.004	0.004	0.008	0.007	0.007	0.008	0.011	0.005	0.006
Ni			0.006	0.000	0.004	0.005									
Sum cat.	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000
End-members (mole %)															
Mg_2SiO_4	71.42	75.57	77.61	76.66	70.79	76.93	87.31	87.44	77.85	77.85	78.56	78.10	71.44	75.43	75.91
Fe_2SiO_4	27.37	23.25	21.64	22.75	28.17	21.81	11.51	11.43	21.04	21.14	20.47	20.97	27.20	23.59	22.82
Mn_2SiO_4	0.80	0.97	0.28	0.30	0.48	0.63	0.98	0.93	0.72	0.68	0.59	0.54	0.83	0.75	0.96
Ca_2SiO_4	0.41	0.21	0.19	0.29	0.35	0.39	0.20	0.20	0.40	0.33	0.37	0.39	0.54	0.24	0.30
Ni_2SiO_4			0.28	0.00	0.20	0.24									

TiO_2, Cr_2O_3 and Al_2O_3 are below detection limits (<0.005 wt.%); n.d. – not determined; c, m, r – core, middle and rim of grain.

Table S2. Chemical (EDS-WDS, wt.%) composition of clinopyroxene from host basaltic trachyandesite, Duplex lava tube, Tolbachik.

Sample	Sh1-1		Sh1-1	Sh1-6		Sh1-1-3	Sh1-1-3	Sh1-2-3	Sh1-4-2	Sh2-19
Position	**c**	**c**	**c**	**c**	**c**	**c**	**c**	**c**	**c**	**c**
SiO_2	49.90	51.12	49.70	49.31	49.53	49.73	49.13	46.57	49.80	47.45
TiO_2	1.39	1.20	1.98	2.38	1.98	1.62	2.10	2.39	1.70	2.50
Al_2O_3	2.97	2.25	3.53	3.80	3.29	3.40	3.72	5.59	3.12	4.88
Fe_2O_3	2.60	1.57	2.32	2.57	2.67	2.27	2.20	6.33	2.36	3.93
FeO	8.59	9.61	8.84	6.77	8.21	9.19	9.31	6.12	9.57	8.54
MnO	0.30	0.37	0.32	0.33	0.35	0.26	0.30	0.22	0.26	0.30
MgO	14.60	14.74	14.01	13.44	13.56	13.85	12.87	11.24	13.41	12.51
CaO	19.19	18.95	19.47	20.82	19.97	19.60	20.40	21.15	19.53	19.89
Na_2O	0.31	0.36	0.46	0.73	0.58	0.36	0.42	0.94	0.50	0.51
Sum	99.83	100.18	100.63	100.15	100.14	100.29	100.45	100.55	100.26	100.51
Formula based on 4 cations and 6 oxygens										
Si	1.870	1.908	1.851	1.840	1.855	1.861	1.843	1.753	1.868	1.784
Al	0.130	0.092	0.149	0.160	0.145	0.139	0.157	0.247	0.132	0.216
Sum T	*2.000*	*2.000*	*2.000*	*2.000*	*2.000*	*2.000*	*2.000*	*2.000*	*2.000*	*2.000*
Al	0.001	0.007	0.006	0.007	0.000	0.010	0.007	0.001	0.006	0.000
Ti	0.039	0.034	0.055	0.067	0.056	0.046	0.059	0.068	0.048	0.071
Fe^{3+}	0.073	0.044	0.065	0.072	0.075	0.064	0.062	0.179	0.067	0.111
Fe^{2+}	0.269	0.300	0.275	0.211	0.257	0.288	0.292	0.193	0.300	0.269
Mn	0.009	0.012	0.010	0.010	0.011	0.008	0.010	0.007	0.008	0.010
Mg	0.815	0.820	0.778	0.748	0.757	0.772	0.719	0.631	0.750	0.701
Sum O	*1.207*	*1.216*	*1.190*	*1.115*	*1.156*	*1.188*	*1.150*	*1.079*	*1.179*	*1.161*
Ca	0.771	0.758	0.777	0.832	0.801	0.786	0.820	0.853	0.785	0.801
Na	0.022	0.026	0.033	0.053	0.042	0.026	0.031	0.069	0.036	0.037
Sum Ca	*0.793*	*0.784*	*0.810*	*0.885*	*0.844*	*0.812*	*0.850*	*0.922*	*0.821*	*0.838*
mole %										
En	41.60	41.84	40.12	38.81	38.94	39.72	37.21	32.65	38.52	36.34
Fs	17.96	18.16	18.08	15.25	17.67	18.51	18.81	19.63	19.28	20.19
Wo	40.44	40.00	41.80	45.94	43.40	41.76	43.98	47.72	42.20	43.47

Cr_2O_3 is below detection limit (<0.005 wt.%); c – core of grain. Total FeO were divided into FeO and Fe_2O_3 by charge balance.

Table S3. Chemical (EDS-WDS, wt.%) composition of Fe-Ti-oxides from host basaltic trachyandesite, Duplex lava tube, Tolbachik.

Sample			Phase	*n*	TiO_2	Cr_2O_3	V_2O_3	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	ZnO	Sum	Ti	Cr	V	Al	Fe^{3+}	Fe^{2+}	Mn	Mg	Ca	Zn
Sh1-6-1	gm	hom	Mgt	*2*	12.05	0.04	0.35	2.43	44.85	34.88	1.04	4.25	0.09	0.12	100.10	0.329	0.001	0.010	0.104	1.226	1.060	0.032	0.230	0.003	0.003
Sh1-6-1	gm	decay	Ulv	*2*	34.56	0.04	0.31	0.48	3.66	54.99	0.76	4.68	0.16	0.00	99.62	0.935	0.001	0.009	0.020	0.099	1.655	0.023	0.251	0.006	0.000
			Mgt	*2*	1.83	0.04	0.44	3.61	61.81	28.83	0.44	2.35	0.19	0.19	99.72	0.051	0.001	0.013	0.158	1.726	0.895	0.014	0.130	0.008	0.005
Sh1-14-1	ph	hom	Mgt	*2*	12.34	4.83	0.22	2.23	40.16	33.51	0.73	5.53	0.04	0.08	99.67	0.335	0.138	0.006	0.095	1.091	1.012	0.022	0.297	0.002	0.002
Sh1-20	ph	decay	Mgt	*6*	4.88	4.08	0.75	5.08	51.98	27.14	0.11	5.99	0.00	0.11	100.13	0.130	0.115	0.022	0.213	1.390	0.807	0.003	0.317	0.000	0.003
	ph	decay	Ulv	*1*	30.94	0.72	0.58	0.56	9.77	51.14	0.33	5.37	0.00	0.00	99.40	0.837	0.020	0.017	0.024	0.265	1.539	0.010	0.288	0.000	0.000
	ph	decay	Ilm	*1*	44.65	0.71	0.41	0.40	23.27	18.93	0.50	11.62	0.00	0.00	100.49	0.781	0.013	0.008	0.011	0.407	0.368	0.010	0.403	0.000	0.000
Sh2-1	ph	decay	Mgt	*2*	3.37	0.04	0.69	4.25	59.72	25.52	0.78	5.51	0.00	0.15	100.04	0.091	0.001	0.020	0.180	1.617	0.768	0.024	0.296	0.000	0.004
			Ti-Mgt	*2*	26.21	0.04	0.62	0.71	19.27	47.88	0.35	4.71	0.00	0.00	99.80	0.713	0.001	0.018	0.030	0.525	1.448	0.011	0.254	0.000	0.000
Sh2-1	ph	decay	Mgt	*3*	2.86	0.24	0.77	4.49	60.44	25.06	0.69	5.64	0.00	0.18	100.38	0.077	0.007	0.022	0.189	1.628	0.750	0.021	0.301	0.000	0.005
			Ti-Mgt	*2*	27.28	0.14	0.54	0.57	17.36	48.15	0.41	5.06	0.00	0.00	99.52	0.742	0.004	0.016	0.024	0.472	1.456	0.013	0.273	0.000	0.000
Sh2-1	ph	decay	Mgt	*1*	3.67	0.32	0.62	4.29	58.91	25.69	0.77	5.67			99.94	0.099	0.009	0.018	0.182	1.593	0.772	0.023	0.304	0.000	0.000
			Ti-Mgt	*1*	26.16	0.19	0.65	0.91	19.33	47.60	0.43	4.91			100.19	0.707	0.005	0.019	0.039	0.523	1.431	0.013	0.263	0.000	0.000
Sh2-2x	gm	hom	Mgt	*1*	13.34	0.13	0.04	0.92	44.07	35.65	0.50	4.56	0.19	0.03	99.43	0.369	0.004	0.001	0.040	1.218	1.095	0.015	0.250	0.007	0.001
Sh2-2	gm	decay	Mgt	*1*	1.71	0.06	0.28	2.45	64.69	24.38	0.83	4.79	0.14	0.16	99.47	0.047	0.002	0.008	0.106	1.789	0.749	0.026	0.262	0.006	0.004
			Ti-Mgt	*1*	22.20	0.02	0.08	0.43	26.88	46.52	0.26	3.00	0.19	0.00	99.58	0.616	0.001	0.002	0.019	0.746	1.436	0.008	0.165	0.007	0.000
sh2-16	ph	decay	Ti-Mgt	*6*	16.18	2.17	0.67	1.28	35.22	40.30	0.33	3.62	0.08	0.00	99.85	0.446	0.063	0.020	0.055	0.971	1.235	0.010	0.198	0.003	0.000
			Mgf	*4*	2.36	6.31	0.55	8.98	53.31	15.01	1.65	11.67	0.05	0.28	100.17	0.060	0.167	0.015	0.355	1.345	0.421	0.047	0.583	0.002	0.007
Sh2-19x	gm	decay	Mgt	*1*	9.94	0.00	0.31	1.89	48.83	35.37	0.65	2.81	0.13	0.13	100.06	0.276	0.000	0.009	0.082	1.357	1.092	0.020	0.155	0.005	0.004
Sh2-19x	gm	decay	Mgt	*1*	5.95	0.00	0.35	2.11	56.63	30.18	0.87	3.62	0.16	0.15	100.02	0.165	0.000	0.010	0.092	1.569	0.929	0.027	0.199	0.006	0.004
Sh1-1-1	ph	decay	Mgt	*1*	9.04	4.37	0.69	3.85	44.20	33.14	0.66	4.18			100.13	0.245	0.125	0.020	0.164	1.201	1.000	0.020	0.225	0.000	0.000
			Ilm	*3*	48.62	0.67	0.26	0.35	12.96	28.08	0.85	8.29			100.08	0.870	0.013	0.005	0.010	0.232	0.559	0.017	0.294	0.000	0.000
Sh1-2-2	gm	hom	Mgt	*1*	1.30	0.00	0.28	1.53	67.37	22.27	1.47	5.67			99.89	0.036	0.000	0.008	0.066	1.854	0.681	0.046	0.309	0.000	0.000
Sh1-2-2	gm	decay	Ti-Mgt	*1*	18.00	0.00	0.00	1.00	34.68	42.72	0.57	3.02			99.98	0.498	0.000	0.000	0.043	0.960	1.315	0.018	0.166	0.000	0.000
Sh1-2-4	gm	hom	Mgt	*1*	3.69	0.00	0.19	1.80	63.13	21.91	1.23	7.43			99.37	0.100	0.000	0.006	0.077	1.717	0.662	0.038	0.400	0.000	0.000
Sh1-4-2	gm	decay	Ti-Mgt	*1*	11.69	0.00	0.37	1.38	45.02	40.64	0.18	0.90			100.18	0.329	0.000	0.011	0.061	1.269	1.273	0.006	0.050	0.000	0.000
			Mgt	*1*	1.22	0.00	0.38	7.50	58.59	29.26	0.39	2.45			99.79	0.033	0.000	0.011	0.321	1.601	0.889	0.012	0.133	0.000	0.000
Sh1-11-1	gm	decay	Mgt	*1*	6.92	1.51	0.62	3.42	51.78	31.90	0.61	3.73			100.49	0.189	0.043	0.018	0.146	1.414	0.968	0.019	0.202	0.000	0.000
Sh1-16-1	gm	hom	Ti-Mgt	*1*	14.81	0.15	0.44	1.21	39.80	40.90	0.32	2.50			100.13	0.412	0.004	0.013	0.053	1.107	1.264	0.010	0.138	0.000	0.000
Sh2-7	ph	decay	Ti-Mgt	*1*	13.58	0.00	0.00	1.15	43.41	37.92	0.39	3.62			100.07	0.375	0.000	0.000	0.050	1.200	1.165	0.012	0.198	0.000	0.000

NiO and SiO_2 are below detection limits (<0.005 wt%). Spinel-supergroup minerals are caclucated on the basis of 3 cations and 4 oxygens, ilmenite - on the basis of 2 cations and 3 oxygens. Total FeO were divided into FeO and Fe_2O_3 by charge balance. Mgt – Ti-poor magnetite; Ti-Mgt – Ti-rich magnetite; Ulv – ulvospinel; Mgf – magnesioferrite; ph – phenocryst/microphenocryst; gm – skeletal crystals in groundmass; hom – homogeneous composition; decay – solid state decay.

Table S4. Chemical (EDS-WDS, wt.%) composition of feldspars from host basaltic trachyandesite, Duplex lava tube, Tolbachik.

	Plagioclase														**K-feldspar**		
Sample	Sh1-1-1	Sh1-1-2	Sh1-1-2	Sh1-1-3	Sh1-1-4	Sh1-2-3	Sh1-2-4	Sh1-2-4	Sh1-2-6	Sh1-4-1	Sh1-4-2	Sh1-6-1	Sh1-13-1	Sh2-1	Sh1-1-2	Sh1-1-4	Sh1-4-1
Position	**c**	**c**	**c**	**c**	**c**	**c**	**c**	**c**	**c**	**c**	**c**	**c**	**c**	**c**			
SiO_2	54.55	58.88	53.65	56.84	54.08	54.37	53.88	55.02	54.64	53.96	54.32	58.3	50.21	51.73	64.83	64.67	64.56
TiO_2	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.53	0.65	0.48
Al_2O_3	28.11	25.02	28.48	26	28.04	28.3	28.34	27.56	27.93	28.17	27.96	25.26	31.01	30.05	17.07	16.08	17.15
FeO	0.99	1.02	1.05	1.18	1.18	1.05	1.12	1.13	0.95	1.13	1.04	1.08	0.72	0.89	0.86	1.98	1.49
CaO	11.05	7.81	11.62	8.59	10.55	10.98	11.42	10.44	11.24	11.25	10.87	7.98	14.3	13.64	1.47	0.66	0.53
BaO	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	1.05	0.29	0.39
Na_2O	4.89	6.27	4.62	5.96	5.09	4.86	4.78	5.2	4.84	4.71	5.03	6.2	3.24	3.6	1.83	0.63	2.15
K_2O	0.69	1.22	0.59	1.08	0.82	0.65	0.6	0.83	0.52	0.65	0.65	1.25	0.28	0.29	12.64	14.93	13.17
Sum	100.28	100.22	100.01	99.65	99.76	100.21	100.14	100.18	100.12	99.87	99.87	100.07	99.76	100.2	100.28	99.89	99.92
Formula based on 8 oxygens																	
Si	2.470	2.645	2.441	2.579	2.465	2.464	2.448	2.494	2.476	2.457	2.471	2.627	2.302	2.356	2.995	3.019	2.992
Ti															0.018	0.023	0.017
Al	1.501	1.325	1.527	1.391	1.507	1.512	1.518	1.473	1.492	1.512	1.499	1.342	1.676	1.613	0.929	0.885	0.937
Fe	0.037	0.038	0.040	0.045	0.045	0.040	0.043	0.043	0.036	0.043	0.040	0.041	0.028	0.034	0.033	0.077	0.058
Ca	0.536	0.376	0.566	0.418	0.515	0.533	0.556	0.507	0.546	0.549	0.530	0.385	0.702	0.666	0.073	0.033	0.026
Ba															0.019	0.005	0.007
Na	0.429	0.546	0.408	0.524	0.450	0.427	0.421	0.457	0.425	0.416	0.444	0.542	0.288	0.318	0.164	0.057	0.193
K	0.040	0.070	0.034	0.063	0.048	0.038	0.035	0.048	0.030	0.038	0.038	0.072	0.016	0.017	0.745	0.889	0.779
Sum	5.014	5.000	5.016	5.019	5.030	5.013	5.021	5.022	5.005	5.014	5.020	5.009	5.012	5.004	4.976	4.989	5.009
End-members (mole%)																	
$CaAl_2Si_2O_8$	53.33	37.90	56.18	41.58	50.88	53.43	54.95	50.10	54.52	54.75	52.40	38.57	69.77	66.54	7.27	3.35	2.62
$NaAlSi_3O_8$	42.71	55.05	40.42	52.20	44.42	42.80	41.62	45.16	42.48	41.48	43.87	54.23	28.60	31.78	16.38	5.79	19.22
$KAlSi_3O_8$	3.96	7.05	3.40	6.22	4.71	3.77	3.44	4.74	3.00	3.77	3.73	7.19	1.63	1.68	74.45	90.32	77.46
$BaAl_2Si_2O_8$															1.90	0.54	0.70

MnO and MgO are below detection limits (<0.005 wt.%); SrO is not determined; n.d. – not determined; c – core of grain.

Table S5. Chemical (EDS-WDS, wt.%) composition of Si- and Fe-rich glasses from host basaltic trachyandesite, Duplex lava tube, Tolbachik.

Sample	Phase	Position	SiO_2	TiO_2	Al_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	F	Cl	Sum
Sh1-6-1	Fe-glass	glob	14.65	12.38	1.55	12.18	0.71	5.85	28.55	0.32	1.12	21.63		0.16	99.09
Sh1-6-1	Fe-glass	glob	22.14	11.86	1.95	16.58	0.98	8.51	20.46	0.30	0.92	15.10		0.22	99.02
Sh1-6-1	Si-glass	inter	70.23	2.02	13.75	1.05	0.03	0.20	0.52	1.07	10.40	0.48		0.11	99.85
Sh1-6-1	Si-glass	inter	68.74	2.25	13.98	1.07	0.05	0.28	1.15	1.11	10.35	0.76		0.12	99.86
Sh1-1-1	Si-glass	inc in Mgt	70.56	1.00	14.97	1.90	0.04	0.51	0.90	1.37	8.38	0.69	0.00	0.09	100.41
Sh1-1-1	Si-glass	inc in Mgt	70.11	1.18	14.95	1.98	0.14	0.55	1.01	1.29	8.26	0.73	0.00	0.08	100.28
Sh1-1-1	Si-glass	inc in Mgt	69.82	1.28	14.79	2.10	0.17	0.53	1.02	1.40	8.20	0.71	0.00	0.00	100.02
Sh1-1-1	Si-glass	inter	69.64	1.20	15.46	1.45	0.06	0.51	0.84	1.50	8.60	0.44	0.00	0.08	99.78
Sh1-1-2	Si-glass	inter	69.87	2.05	14.35	0.96	0.00	0.18	0.59	1.19	9.48	0.53	0.00	0.10	99.30
Sh1-1-2	Si-glass	inter	71.02	2.14	12.71	1.69	0.00	0.41	0.78	1.21	9.13	0.69	0.00	0.07	99.85
Sh1-1-2	Si-glass	inter	65.04	1.13	16.65	1.51	0.00	0.27	2.00	1.55	11.45	0.41	0.00	0.00	100.01
Sh1-2-2	Si-glass	inter	67.82	2.64	13.83	2.91		0.35	1.05	3.88	7.71	0.27			100.46
Sh1-2-2	Si-glass	inter	64.82	1.82	14.74	2.60		0.28	0.38	3.05	8.63	0.27		0.17	96.76
Sh1-11-1	Si-glass	inc in Ol	69.04	0.68	16.00	1.54	0.00	0.17	1.29	3.63	6.90	0.48		0.07	99.80
Sh1-16-1	Si-glass	inter	68.25	1.05	14.68	1.89	0.00	0.00		1.59	12.11	0.39		0.15	100.11
Sh2-7	Si-glass	inter	65.71	2.52	13.01	2.96	0.00	0.65	0.38	2.70	11.84	0.64		0.25	100.66
Sh2-7	Si-glass	inter	67.74	2.00	14.27	1.30	0.00	0.33	0.00	2.12	11.41	0.92		0.22	100.31
Sh2-7	Si-glass	inter	66.93	1.72	14.76	1.72	0.00	0.36	0.52	0.90	12.03	0.78		0.00	99.72
Sh2-19-2	Fe-glass	glob	22.80	9.62	2.50	12.56	0.75	8.13	23.06	0.32	1.06	17.32	1.52	0.57	100.18
Sh2-19-2	Fe-glass	glob	19.43	9.29	1.87	11.56	0.70	7.60	26.50	0.32	0.74	19.71	1.22	0.62	99.54
Sh2-19-2	Fe-glass	glob	25.20	9.39	4.91	19.60	0.21	5.46	15.81	2.12	2.19	15.35	0.00	0.00	100.24
Sh2-19-2	Fe-glass	glob	18.13	9.01	3.63	14.48	0.23	6.19	22.71	2.01	1.51	21.62	0.00	0.07	99.59
Sh2-19-2	Si-glass	inter	71.35	2.50	12.47	1.67	0.00	0.46	1.41	2.74	6.56	0.87	0.00	0.09	100.12
Sh2-19-2	Si-glass	inter	68.96	2.34	14.14	2.50	0.00	0.60	0.87	3.57	6.51	0.53			100.02
Sh2-19-2	Si-glass	inter	70.76	2.09	14.16	1.34	0.00	0.25	0.59	3.13	7.36	0.46			100.14
Sh2-19-3	Si-glass	inter	70.49	2.27	13.13	1.57	0.00	0.71	1.04	1.81	7.43	0.89	0.00	0.07	99.41

glob – globules of Fe-rich glass in Si-rich glass; inter – interstitial Si-rich glass in groundmass; inc in Mgt – melt inclusion in phenocrystal magnetite; inc in Ol – melt inclusion in phenocrystal olivine.

Table S6. Chemical composition (EMPA, wt.%) of Cu-containing magnesioferrite from vesicles in trachyandesite, Duplex lava tube, Tolbachik.

Sample	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	ZnO	CuO	Sum	Ti	Al	Fe^{3+}	Sum R^{3+}	Fe^{2+}	Mn	Mg	Ca	Zn	Cu	Sum R^{2+}
	wt.%										*Formula based on 3 cations and 4 oxygens*										
Sh1-1-6	1.73	3.24	71.94	0.56	2.52	18.51	0.06	0.62	1.15	100.32	0.043	0.126	1.788	1.957	0.015	0.070	0.911	0.002	0.015	0.029	1.043
Sh1-2-3	0.20	1.79	72.06	0.02	2.08	11.63	0.43	0.33	11.45	99.98	0.005	0.075	1.915	1.995	0.001	0.062	0.612	0.016	0.008	0.306	1.005
Sh1-2-3	0.21	1.91	72.02	0.02	2.11	11.65	0.31	0.37	11.60	100.20	0.006	0.079	1.910	1.994	0.001	0.063	0.612	0.012	0.010	0.309	1.006
Sh1-2-3	0.21	2.06	71.46	0.05	2.11	11.24	0.46	0.38	11.99	99.96	0.006	0.086	1.903	1.994	0.001	0.063	0.593	0.017	0.010	0.321	1.006
Sh1-2-3	0.52	2.00	70.64	0.05	2.05	11.04	0.36	0.52	12.62	99.79	0.014	0.084	1.889	1.986	0.001	0.062	0.585	0.014	0.014	0.339	1.014
Sh1-2-3	0.22	2.09	70.66	0.01	2.06	10.32	0.37	0.48	13.60	99.81	0.006	0.088	1.900	1.994	0.000	0.062	0.550	0.014	0.013	0.367	1.006
Sh1-2-4	0.52	1.89	71.50	0.01	2.07	12.21	0.42	0.33	10.79	99.73	0.014	0.079	1.894	1.986	0.000	0.062	0.641	0.016	0.008	0.287	1.014
Sh1-2-4	0.21	1.79	72.35	0.00	2.13	12.00	0.43	0.30	10.87	100.08	0.005	0.074	1.915	1.995	0.000	0.063	0.629	0.016	0.008	0.289	1.005
Sh1-2-4	0.20	1.84	72.39	0.00	2.15	12.04	0.41	0.25	10.89	100.17	0.005	0.076	1.913	1.995	0.000	0.064	0.630	0.015	0.007	0.289	1.005
Sh1-2-5	0.40	1.77	71.50	0.04	2.09	11.69	0.42	0.37	11.37	99.65	0.011	0.074	1.905	1.989	0.001	0.063	0.617	0.016	0.010	0.304	1.011
Sh1-2-5	0.17	2.09	71.54	0.04	2.10	11.35	0.34	0.36	11.98	99.97	0.004	0.087	1.904	1.996	0.001	0.063	0.598	0.013	0.009	0.320	1.004
Sh1-2-5	0.30	2.20	72.33	0.03	2.22	12.82	0.32	0.18	9.88	100.28	0.008	0.090	1.894	1.992	0.001	0.066	0.665	0.012	0.005	0.260	1.008
Sh1-2-5	0.38	1.27	73.27	0.04	2.09	13.33	0.28	0.23	8.93	99.82	0.010	0.052	1.928	1.990	0.001	0.062	0.695	0.010	0.006	0.236	1.010
Sh1-2-5	0.19	1.97	71.69	0.04	2.17	11.70	0.41	0.29	11.22	99.67	0.005	0.082	1.907	1.995	0.001	0.065	0.617	0.016	0.007	0.300	1.005
Sh1-2-6	0.22	1.86	72.13	0.01	2.21	11.74	0.35	0.28	11.39	100.18	0.006	0.077	1.911	1.994	0.000	0.066	0.616	0.013	0.007	0.303	1.006
Sh1-2-6	0.21	1.83	72.05	0.00	2.13	11.71	0.40	0.35	11.33	100.01	0.006	0.076	1.913	1.994	0.000	0.064	0.616	0.015	0.009	0.302	1.006
Sh1-2-6	0.25	1.93	71.97	0.03	2.10	12.07	0.30	0.37	10.86	99.87	0.007	0.080	1.907	1.993	0.001	0.063	0.634	0.011	0.010	0.289	1.007
Sh1-2-6	0.21	1.73	72.22	0.00	2.16	12.34	0.27	0.19	10.40	99.53	0.006	0.072	1.917	1.994	0.000	0.065	0.649	0.010	0.005	0.277	1.006
Sh1-2-6	0.28	1.90	72.72	0.00	2.02	13.11	0.35	0.19	9.44	100.01	0.007	0.078	1.907	1.993	0.000	0.060	0.681	0.013	0.005	0.249	1.007
Sh1-2-6	0.30	1.66	72.97	0.05	2.10	13.20	0.32	0.13	9.22	99.94	0.008	0.068	1.916	1.992	0.001	0.062	0.687	0.012	0.003	0.243	1.008
Sh1-2-6	0.22	1.87	73.02	0.02	2.21	13.47	0.36	0.29	8.40	99.85	0.006	0.077	1.912	1.994	0.000	0.065	0.699	0.013	0.007	0.221	1.006
Sh1-2-7	0.35	1.78	72.81	0.00	2.23	12.95	0.26	0.29	9.67	100.34	0.009	0.073	1.908	1.991	0.000	0.066	0.672	0.010	0.007	0.254	1.009
Sh1-2-7	0.35	1.93	71.93	0.01	2.10	12.23	0.31	0.36	10.73	99.95	0.009	0.080	1.902	1.991	0.000	0.063	0.641	0.012	0.009	0.285	1.009
Sh1-2-7	0.25	1.82	71.09	0.00	1.96	10.67	0.39	0.42	13.09	99.69	0.007	0.076	1.910	1.993	0.000	0.059	0.568	0.015	0.011	0.353	1.007
Sh1-2-7	0.22	1.87	71.69	0.00	2.06	11.35	0.43	0.47	11.83	99.92	0.006	0.078	1.910	1.994	0.000	0.062	0.599	0.016	0.012	0.316	1.006
Sh1-2-7	0.24	1.76	71.94	0.04	2.08	11.44	0.46	0.44	11.64	100.04	0.006	0.073	1.914	1.994	0.001	0.062	0.603	0.017	0.012	0.311	1.006
Sh1-2-7	0.21	1.78	71.96	0.07	2.12	11.35	0.39	0.40	11.85	100.12	0.006	0.074	1.915	1.994	0.002	0.064	0.598	0.015	0.010	0.317	1.006
Sh1-2-8	0.31	2.18	71.89	0.00	2.15	12.51	0.42	0.28	10.16	99.89	0.008	0.090	1.894	1.992	0.000	0.064	0.653	0.016	0.007	0.269	1.008
Sh1-2-8	0.26	2.01	72.22	0.03	2.21	12.48	0.38	0.31	10.09	99.99	0.007	0.083	1.903	1.993	0.001	0.066	0.652	0.014	0.008	0.267	1.007
Sh1-2-8	0.45	1.74	72.52	0.03	2.21	13.07	0.50	0.16	9.22	99.91	0.012	0.072	1.904	1.988	0.001	0.065	0.680	0.019	0.004	0.243	1.012
Sh1-2-8	0.31	1.92	72.16	0.04	2.13	12.34	0.32	0.38	10.44	100.05	0.008	0.079	1.904	1.992	0.001	0.063	0.645	0.012	0.010	0.277	1.008
Sh1-2-8	0.25	1.87	72.06	0.03	2.11	12.04	0.33	0.38	10.86	99.92	0.007	0.077	1.909	1.993	0.001	0.063	0.632	0.012	0.010	0.289	1.007
Sh1-2-9	0.22	1.81	71.39	0.01	2.13	11.23	0.36	0.47	11.88	99.50	0.006	0.076	1.912	1.994	0.000	0.064	0.596	0.014	0.012	0.319	1.006
Sh1-2-9	0.27	1.78	71.76	0.02	2.28	11.55	0.34	0.32	11.49	99.80	0.007	0.074	1.912	1.993	0.001	0.068	0.610	0.013	0.008	0.307	1.007
Sh1-2-9	0.24	1.79	72.61	0.00	2.17	12.72	0.28	0.26	9.84	99.92	0.006	0.074	1.914	1.994	0.000	0.064	0.664	0.011	0.007	0.260	1.006
Sh1-2-9	0.29	1.77	73.13	0.02	2.14	13.34	0.27	0.19	9.07	100.21	0.007	0.073	1.912	1.993	0.000	0.063	0.691	0.010	0.005	0.238	1.007
Sh1-2-9	0.20	1.80	72.21	0.02	2.16	11.75	0.31	0.37	11.33	100.14	0.005	0.075	1.915	1.995	0.001	0.064	0.617	0.012	0.010	0.302	1.005
Sh1-3-1	0.30	1.62	71.52	0.00	2.65	10.86	0.19	0.49	12.33	99.96	0.008	0.068	1.916	1.992	0.000	0.080	0.576	0.007	0.013	0.332	1.008
Sh1-3-1	0.31	1.77	71.22	0.00	2.69	10.88	0.18	0.58	12.17	99.81	0.008	0.074	1.909	1.992	0.000	0.081	0.578	0.007	0.015	0.327	1.008
Sh1-3-1	0.47	1.01	70.35	0.05	2.88	8.56	0.36	0.74	15.34	99.76	0.013	0.043	1.931	1.987	0.002	0.089	0.465	0.014	0.020	0.423	1.013
Sh1-3-1	0.54	0.79	69.83	0.03	2.77	7.47	0.40	0.79	17.27	99.89	0.015	0.034	1.935	1.985	0.001	0.086	0.410	0.016	0.021	0.480	1.015
Sh1-3-1	0.36	1.52	71.60	0.01	2.62	10.73	0.22	0.57	12.58	100.21	0.010	0.064	1.917	1.990	0.000	0.079	0.569	0.008	0.015	0.338	1.010

Sample	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	ZnO	CuO	Sum	Ti	Al	Fe^{3+}	Sum R^{3+}	Fe^{2+}	Mn	Mg	Ca	Zn	Cu	Sum R^{2+}
	wt.%										*Formula based on 3 cations and 4 oxygens*										
Sh1-3-2	0.48	1.43	71.12	0.03	2.54	10.10	0.17	0.66	13.80	100.32	0.013	0.060	1.914	1.987	0.001	0.077	0.538	0.007	0.017	0.373	1.013
Sh1-3-2	0.54	1.02	70.77	0.00	2.58	9.39	0.17	0.68	14.79	99.95	0.015	0.043	1.927	1.985	0.000	0.079	0.507	0.007	0.018	0.404	1.015
Sh1-3-2-2	0.43	1.54	70.75	0.00	2.60	9.90	0.16	0.73	13.91	100.01	0.012	0.065	1.912	1.988	0.000	0.079	0.530	0.006	0.019	0.377	1.012
Sh1-3-3	0.38	1.71	70.93	0.00	2.56	10.50	0.18	0.54	13.04	99.83	0.010	0.072	1.908	1.990	0.000	0.077	0.560	0.007	0.014	0.352	1.010
Sh1-3-3	0.46	1.29	71.04	0.03	2.63	10.27	0.13	0.77	13.13	99.73	0.012	0.055	1.921	1.988	0.001	0.080	0.550	0.005	0.020	0.356	1.012
Sh1-3-3	0.32	1.68	70.95	0.01	2.54	10.40	0.11	0.73	13.03	99.77	0.009	0.071	1.912	1.991	0.000	0.077	0.555	0.004	0.019	0.352	1.009
Sh1-3-3	0.24	1.59	71.42	0.03	2.66	10.62	0.19	0.56	12.50	99.79	0.006	0.067	1.920	1.994	0.001	0.080	0.566	0.007	0.015	0.337	1.006
Sh1-3-3	0.29	1.55	71.48	0.00	2.54	10.53	0.28	0.56	12.83	100.06	0.008	0.065	1.919	1.992	0.000	0.077	0.560	0.011	0.015	0.346	1.008
Sh1-4-1	0.26	2.23	71.69	0.03	2.04	12.27	0.25	0.25	10.83	99.85	0.007	0.092	1.894	1.993	0.001	0.061	0.642	0.009	0.006	0.287	1.007
Sh1-4-1	0.33	2.05	71.96	0.03	2.06	11.98	0.28	0.42	11.30	100.41	0.009	0.085	1.898	1.991	0.001	0.061	0.626	0.011	0.011	0.299	1.009
Sh1-4-1	0.38	1.08	71.85	0.01	1.89	10.63	0.15	0.75	13.34	100.06	0.010	0.045	1.934	1.990	0.000	0.057	0.567	0.006	0.020	0.360	1.010
Sh1-4-1	0.30	1.82	70.96	0.06	2.18	10.70	0.24	0.66	12.75	99.67	0.008	0.077	1.907	1.992	0.002	0.066	0.570	0.009	0.018	0.344	1.008
Sh1-14-1	0.23	2.30	72.59	0.03	2.15	13.71	0.10	0.30	8.48	99.90	0.006	0.094	1.894	1.994	0.001	0.063	0.709	0.004	0.008	0.222	1.006
Sh1-17-1	0.40	1.61	72.01	0.00	2.27	11.75	0.21	0.47	11.42	100.14	0.011	0.067	1.912	1.989	0.000	0.068	0.618	0.008	0.012	0.304	1.011
Sh1-17-1	0.36	0.99	71.61	0.00	2.24	10.05	0.40	0.80	13.47	99.92	0.010	0.042	1.938	1.990	0.000	0.068	0.539	0.015	0.021	0.366	1.010
Sh1-18-1	0.52	1.25	71.35	0.06	2.08	10.84	0.17	0.62	12.90	99.79	0.014	0.053	1.919	1.986	0.002	0.063	0.578	0.007	0.016	0.348	1.014
Sh1-18-1	0.46	1.13	70.93	0.02	2.26	9.61	0.14	0.74	14.68	99.98	0.013	0.048	1.927	1.987	0.001	0.069	0.517	0.006	0.020	0.400	1.013
Sh1-19-4	0.30	2.00	71.32	0.03	2.39	11.27	0.25	0.57	11.82	99.94	0.008	0.083	1.901	1.992	0.001	0.072	0.595	0.009	0.015	0.316	1.008
Sh1-19-4	0.55	1.47	71.63	0.11	2.51	11.41	0.21	0.57	11.61	100.08	0.015	0.061	1.909	1.985	0.003	0.075	0.602	0.008	0.015	0.311	1.015
Sh1-20-2	0.23	1.60	71.78	0.00	2.07	11.13	0.30	0.42	12.34	99.87	0.006	0.067	1.920	1.994	0.000	0.062	0.590	0.012	0.011	0.331	1.006
Sh1-20-2	0.21	1.74	71.76	0.04	2.11	10.85	0.38	0.37	12.80	100.26	0.006	0.073	1.916	1.994	0.001	0.063	0.574	0.015	0.010	0.343	1.006
Sh1-20-2	0.18	1.73	71.89	0.37	1.93	11.08	0.40	0.29	12.22	100.09	0.005	0.072	1.918	1.995	0.011	0.058	0.586	0.015	0.008	0.327	1.005
Sh1-20-2	0.26	1.35	71.64	0.10	1.87	10.44	0.23	0.66	13.46	100.01	0.007	0.057	1.929	1.993	0.003	0.057	0.557	0.009	0.017	0.364	1.007
Sh1-20-2	0.27	1.66	71.68	0.51	1.87	11.08	0.39	0.21	12.25	99.92	0.007	0.070	1.916	1.993	0.015	0.056	0.587	0.015	0.006	0.329	1.007
Sh1-20-2	0.23	1.64	71.55	0.10	1.90	10.72	0.20	0.58	13.15	100.06	0.006	0.069	1.919	1.994	0.003	0.057	0.569	0.008	0.015	0.354	1.006
Sh1-20-3	0.22	1.71	72.16	0.11	1.97	11.25	0.37	0.17	12.47	100.43	0.006	0.071	1.918	1.994	0.003	0.059	0.592	0.014	0.005	0.333	1.006
Sh1-20-3	0.26	1.55	71.86	0.19	2.07	11.21	0.16	0.56	12.09	99.95	0.007	0.065	1.921	1.993	0.006	0.062	0.594	0.006	0.015	0.324	1.007
Sh1-20-3	0.31	0.95	71.04	0.02	2.19	9.16	0.25	0.81	15.05	99.77	0.009	0.041	1.942	1.991	0.001	0.067	0.496	0.010	0.022	0.413	1.009
Sh1-20-4	0.18	1.71	72.19	0.00	2.00	11.73	0.29	0.22	11.63	99.96	0.005	0.071	1.919	1.995	0.000	0.060	0.618	0.011	0.006	0.310	1.005
Sh1-20-4	0.18	1.98	71.81	0.03	2.03	11.52	0.31	0.37	11.82	100.07	0.005	0.083	1.908	1.995	0.001	0.061	0.606	0.012	0.010	0.315	1.005
Sh1-20-4	0.27	1.86	71.51	0.04	2.04	11.25	0.27	0.39	12.31	99.94	0.007	0.078	1.908	1.993	0.001	0.061	0.595	0.010	0.010	0.330	1.007
Sh1-20-5	0.46	2.07	71.54	0.04	1.99	12.23	0.47	0.24	10.87	99.91	0.012	0.086	1.890	1.988	0.001	0.059	0.640	0.018	0.006	0.288	1.012
Sh1-20-5	0.18	1.70	71.99	0.02	2.09	10.82	0.33	0.35	13.01	100.48	0.005	0.071	1.920	1.995	0.000	0.063	0.572	0.012	0.009	0.348	1.005
Sh1-21	0.47	1.16	70.01	0.00	2.91	8.50	0.15	0.81	15.67	99.68	0.013	0.050	1.924	1.987	0.000	0.090	0.463	0.006	0.022	0.432	1.013
Sh1-21	0.49	0.86	69.83	0.03	2.96	7.65	0.25	0.81	16.84	99.71	0.014	0.037	1.936	1.986	0.001	0.092	0.420	0.010	0.022	0.469	1.014
Sh1-21	0.48	1.43	72.20	0.06	2.45	12.03	0.19	0.43	10.79	100.05	0.013	0.059	1.915	1.987	0.002	0.073	0.632	0.007	0.011	0.287	1.013
Sh2-1	0.29	1.58	71.95	0.03	1.88	11.02	0.32	0.63	12.69	100.39	0.008	0.066	1.919	1.992	0.001	0.056	0.582	0.012	0.016	0.340	1.008
Sh2-1	0.34	1.78	71.62	0.03	1.92	11.37	0.32	0.58	12.09	100.03	0.009	0.074	1.908	1.991	0.001	0.057	0.600	0.012	0.015	0.323	1.009
Sh2-2	0.33	1.64	72.92	0.04	1.73	12.88	0.31	0.31	10.12	100.28	0.009	0.068	1.915	1.991	0.001	0.051	0.670	0.011	0.008	0.267	1.009
Sh2-3	0.21	1.61	71.00	0.62	1.88	10.29	0.25	0.62	13.02	99.50	0.006	0.068	1.918	1.994	0.019	0.057	0.551	0.010	0.016	0.353	1.006
Sh2-3	0.94	1.99	73.56	6.25	0.70	15.94	0.35	0.18	0.22	100.13	0.024	0.079	1.873	1.976	0.177	0.020	0.804	0.013	0.005	0.006	1.024
Sh2-4	0.28	1.46	71.61	0.04	1.95	10.59	0.21	0.60	13.36	100.09	0.007	0.062	1.924	1.993	0.001	0.059	0.564	0.008	0.016	0.360	1.007
Sh2-4	0.27	1.67	71.78	0.07	1.92	10.89	0.35	0.60	12.80	100.33	0.007	0.070	1.916	1.993	0.002	0.058	0.576	0.013	0.016	0.343	1.007
Sh2-10	0.23	2.43	72.37	0.01	2.20	13.50	0.19	0.11	8.92	99.96	0.006	0.099	1.889	1.994	0.000	0.065	0.698	0.007	0.003	0.234	1.006

Sample	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	ZnO	CuO	Sum	Ti	Al	Fe^{3+}	Sum R^{3+}	Fe^{2+}	Mn	Mg	Ca	Zn	Cu	Sum R^{2+}
	wt.%										*Formula based on 3 cations and 4 oxygens*										
Sh2-10	0.22	2.35	71.85	0.04	2.18	13.12	0.23	0.08	9.29	99.36	0.006	0.097	1.891	1.994	0.001	0.064	0.684	0.009	0.002	0.245	1.006
Sh2-2x	0.31	1.15	71.93	0.89	1.92	10.57	0.30	0.54	12.40	100.01	0.008	0.049	1.935	1.992	0.027	0.058	0.563	0.012	0.014	0.335	1.008
Sh2-2	0.38	1.08	73.14	0.15	1.69	12.69	0.37	0.28	10.12	99.90	0.010	0.045	1.935	1.990	0.004	0.050	0.665	0.014	0.007	0.269	1.010
Sh2-3x	0.25	0.92	72.28	0.63	1.82	10.48	0.28	0.59	12.84	100.09	0.007	0.039	1.948	1.993	0.019	0.055	0.559	0.011	0.016	0.347	1.007
Sh2-3	0.25	0.94	72.27	0.02	1.87	10.78	0.22	0.72	12.83	99.90	0.007	0.040	1.947	1.993	0.001	0.057	0.575	0.008	0.019	0.347	1.007
Sh2-5	0.28	1.23	71.80	0.56	1.92	10.53	0.54	0.63	12.35	99.85	0.008	0.052	1.933	1.992	0.017	0.058	0.562	0.021	0.017	0.334	1.008
Sh2-5	0.29	1.07	71.62	0.82	1.92	10.36	0.19	0.75	12.56	99.58	0.008	0.045	1.939	1.992	0.025	0.059	0.556	0.007	0.020	0.341	1.008
Sh2-6	0.28	1.26	72.16	0.09	2.01	11.10	0.39	0.70	12.01	99.99	0.008	0.053	1.932	1.992	0.003	0.060	0.589	0.015	0.018	0.323	1.008
Sh2-6	0.30	1.42	71.91	0.56	1.96	11.29	0.28	0.60	11.45	99.77	0.008	0.060	1.924	1.992	0.017	0.059	0.598	0.011	0.016	0.308	1.008
Sh2-6	0.27	1.44	72.01	0.07	1.97	11.31	0.43	0.59	11.75	99.84	0.007	0.060	1.925	1.993	0.002	0.059	0.599	0.016	0.016	0.315	1.007
Sh2-8	0.28	1.34	72.85	0.02	2.05	12.31	0.54	0.09	10.42	99.90	0.007	0.056	1.930	1.993	0.001	0.061	0.646	0.020	0.002	0.277	1.007
Sh2-8	0.32	1.39	72.69	0.01	2.04	12.10	0.60	0.13	10.78	100.04	0.008	0.058	1.926	1.992	0.000	0.061	0.635	0.023	0.003	0.287	1.008
Sh2-10x	0.21	1.34	72.76	0.31	1.99	11.94	0.59	0.14	10.60	99.89	0.006	0.056	1.933	1.994	0.009	0.060	0.628	0.022	0.004	0.283	1.006
Sh2-10x	0.28	1.03	73.00	0.92	1.94	12.02	0.35	0.09	10.23	99.86	0.008	0.043	1.942	1.992	0.027	0.058	0.633	0.013	0.002	0.273	1.008
Sh2-11	0.25	1.86	72.88	0.06	2.27	12.94	0.57	0.02	9.27	100.11	0.007	0.076	1.911	1.993	0.002	0.067	0.672	0.021	0.001	0.244	1.007
Sh2-11	0.67	1.81	72.79	0.08	2.22	14.10	0.62	0.10	7.62	100.00	0.017	0.074	1.892	1.983	0.002	0.065	0.726	0.023	0.003	0.199	1.017
Sh2-11	0.68	1.82	73.04	0.08	2.11	15.02	0.40	0.11	6.46	99.73	0.018	0.074	1.887	1.982	0.002	0.061	0.769	0.015	0.003	0.168	1.018
Sh2-12	0.24	1.32	72.94	0.09	2.10	12.34	0.44	0.10	10.31	99.87	0.006	0.055	1.933	1.994	0.003	0.063	0.648	0.016	0.003	0.274	1.006
Sh2-12	0.24	1.36	72.72	0.37	2.04	12.08	0.64	0.13	10.19	99.75	0.006	0.056	1.931	1.994	0.011	0.061	0.636	0.024	0.003	0.272	1.006
Sh2-12	0.26	1.42	72.48	0.76	2.04	11.99	0.49	0.14	10.10	99.68	0.007	0.059	1.927	1.993	0.023	0.061	0.632	0.019	0.004	0.270	1.007
Sh2-13	0.53	0.92	74.07	0.20	1.90	14.42	0.29	0.12	7.34	99.79	0.014	0.038	1.934	1.986	0.006	0.056	0.746	0.011	0.003	0.192	1.014
Sh2-13	0.58	0.96	73.88	0.39	1.79	14.40	0.34	0.14	7.24	99.71	0.015	0.039	1.930	1.985	0.011	0.053	0.745	0.013	0.003	0.190	1.015
Sh2-13	0.64	1.06	73.58	0.44	1.78	14.49	0.37	0.05	7.11	99.53	0.017	0.044	1.923	1.983	0.013	0.052	0.750	0.014	0.001	0.187	1.017
Sh2-14	0.53	1.40	72.95	0.05	2.43	13.50	0.57	0.13	8.14	99.69	0.014	0.057	1.915	1.986	0.001	0.072	0.702	0.021	0.003	0.214	1.014
Sh2-14	0.47	1.16	73.13	0.01	2.24	13.18	0.67	0.12	8.67	99.66	0.012	0.048	1.927	1.988	0.000	0.066	0.688	0.025	0.003	0.229	1.012
Sh2-14	0.35	1.49	73.30	0.06	2.32	13.34	0.73	0.15	8.20	99.95	0.009	0.061	1.920	1.991	0.002	0.068	0.692	0.027	0.004	0.216	1.009
Sh2-14-2	0.34	1.31	72.86	0.48	2.32	12.80	0.24	0.19	9.06	99.60	0.009	0.054	1.928	1.991	0.014	0.069	0.671	0.009	0.005	0.241	1.009
Sh2-14-2	0.39	1.34	73.01	0.89	2.31	12.80	0.27	0.14	8.83	99.98	0.010	0.055	1.924	1.990	0.026	0.068	0.668	0.010	0.004	0.234	1.010
Sh2-14-2	0.39	1.58	72.61	0.71	2.38	12.97	0.27	0.12	8.64	99.67	0.010	0.065	1.913	1.990	0.021	0.070	0.677	0.010	0.003	0.229	1.010
Sh2-14-2	0.33	1.55	72.73	0.96	2.33	12.69	0.22	0.19	8.88	99.88	0.009	0.064	1.919	1.991	0.028	0.069	0.663	0.008	0.005	0.235	1.009
Sh2-16	0.12	1.03	74.09	0.00	2.09	13.45	0.28	0.11	8.55	99.73	0.003	0.042	1.951	1.997	0.000	0.062	0.702	0.011	0.003	0.226	1.003
Sh2-16	0.11	1.00	73.87	0.29	2.00	13.06	0.19	0.14	9.04	99.69	0.003	0.041	1.953	1.997	0.009	0.060	0.684	0.007	0.004	0.240	1.003
Sh2-18	0.39	0.84	74.29	0.44	1.84	14.20	0.25	0.10	7.42	99.77	0.010	0.035	1.945	1.990	0.013	0.054	0.736	0.009	0.002	0.195	1.010
Sh2-17	0.78	1.00	74.03	0.06	2.71	15.06	0.15	0.35	5.82	99.96	0.020	0.041	1.919	1.980	0.002	0.079	0.773	0.006	0.009	0.151	1.020
Sh2-17	0.71	1.39	73.38	0.01	2.62	14.50	0.15	0.32	6.95	100.02	0.018	0.057	1.907	1.982	0.000	0.077	0.746	0.006	0.008	0.181	1.018

SiO_2, Cr_2O_3, V_2O_3 and NiO are below detection limits (<0.01 wt.%). FeO and Fe_2O_3 are calculated by charge balance.