

Appendix 1. Chemical composition of newly formed minerals

Synthetic sphalerite compositions

Elem., wt. %	7301 ¹⁾	7320	7321	7336	7337	7368	7369	7385	7386	7387	7388
Mn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.93	0.00
Fe	11.14	5.27	8.99	8.10	6.64	2.26	5.67	3.09	0.00	9.56	9.42
Zn	54.62	60.01	55.48	55.8	61.37	66.50	61.35	49.34	40.46	45.1	46.2
Cd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.51	30.99	13.13	12.63
S	34.24	34.73	35.59	35.41	32.01	31.24	32.99	30.06	28.55	30.84	31.65
sum	100.00	100.01	100.06	99.30	100.02	100.00	100.01	100.00	100.00	99.56	99.89
sI	0.966	0.988	0.990	1.002	0.945	0.945	0.962	1.035	1.118	1.005	1.013
Atomic proportion per formula unit (apfu) (calculation to 1 cation)											
Mn	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.017	0.000
Fe	0.193	0.093	0.159	0.145	0.112	0.038	0.098	0.057	0.000	0.172	0.171
Zn	0.807	0.907	0.841	0.855	0.888	0.962	0.902	0.781	0.692	0.694	0.715
Cd	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.161	0.308	0.117	0.114
S	1.032	1.070	1.099	1.106	0.944	0.921	0.989	0.971	0.995	0.967	1.000

¹⁾ – number of experiment

Synthetic pyrrhotite compositions

Elem., wt. %	7301	7378	7379	7387	7388
Fe	59.61	54.36	53.54	56.12	56.35
Ni	0.00	3.66	4.15	1.65	1.39
Cu	1.29	2.57	3.52	3.08	1.11
S	39.17	39.04	38.79	39.36	40.17
sum	100.07	99.63	100.00	100.21	99.02
apfu (calculation to 1 cation)					
Fe	0.981	0.904	0.884	0.929	0.961
Ni	0.000	0.058	0.065	0.026	0.023
Cu	0.019	0.038	0.051	0.045	0.017
S	1.123	1.132	1.115	1.135	1.193

Synthetic pyrite compositions

Elem., wt. %	7301	7320	7321	7379	7387	7388
Fe	46.68	44.21	45.09	46.48	46.7	46.73
Mn	0.00	0.00	0.33	0.00	0.00	0.00
Ni	0.00	0.00	0.00	0.00	0.75	0.00
Cu	0.00	0.00	0.00	0.00	1.34	0.00
Zn	0.09	1.48	0.60	0.00	0.00	0.00
S	53.24	54.31	53.98	53.52	51.50	53.26
sum	100.010	100.00	100.00	100.00	100.29	99.99
apfu (calculation to 1 cation)						
Fe	0.998	0.972	0.982	1.000	0.961	1.000
Mn	0.000	0.000	0.007	0.000	0.000	0.000
Ni	0.000	0.000	0.000	0.000	0.015	0.000
Cu	0.000	0.000	0.000	0.000	0.024	0.000
Zn	0.002	0.028	0.011	0.000	0.000	0.000
S	1.983	2.080	2.047	2.006	1.846	1.985

Synthetic chalcopyrite compositions

Elem., wt.%	7378	7379	7387
Fe	37.43	37.01	28.22
Cu	27.49	27.75	33.84
As	0.00	0.00	2.43
S	34.89	35.24	35.52
sum	99.81	100.00	100.01
apfu (calculation to 2 cations)			
Fe	1.215	1.206	0.974
Cu	0.785	0.794	1.026
As	0.000	0.000	0.063
S	1.974	2.000	2.135

Synthetic galena compositions

Elem., wt.%	7300	7369	7378	7385	7387	7388
Fe	3.83	0.00	0.98	0.00	0.00	0.38
Cu	0.00	0.00	0.75	0.31	0.52	2.39
Zn	0.00	0.69	0.00	0.00	0.37	0.18
As	0.00	0.00	0.00	0.00	4.37	3.23
Au	0.00	0.00	0.00	0.00	3.47	4.57
Pb	83.88	85.14	85.09	85.77	68.28	64.66
Bi	0.00	0.00	0.000	0.00	6.57	8.42
S	12.28	14.14	13.80	13.60	16.10	16.22
sum	99.99	99.97	100.613	99.68	99.68	99.67
apfu (calculation to 1 cation)						
Fe	0.160	0.000	0.040	0.000	0.000	0.012
Cu	0.000	0.000	0.027	0.012	0.018	0.062
Zn	0.000	0.025	0.000	0.000	0.013	0.006
As	0.000	0.000	0.000	0.000	0.129	0.077
Au	0.000	0.000	0.000	0.000	0.039	0.049
Pb	0.945	0.975	0.934	0.988	0.731	0.664
Bi	0.000	0.000	0.000	0.000	0.070	0.086
S	0.894	1.046	0.979	1.013	1.114	1.044

Synthetic amphibole compositions

Elem., wt. %	7300	7301	7320	7337	7379
SiO ₂	46.46	45.42	44.86	47.71	50.76
TiO ₂	1.37	2.29	2.52	1.94	2.10
Al ₂ O ₃	9.35	10.65	11.81	4.74	12.09
FeO	18.63	0.00	14.18	14.80	4.07
MnO	0.72	13.40	0.12	0.23	0.14
MgO	7.73	0.57	14.82	8.10	12.37
CaO	11.75	12.10	7.52	16.98	10.10
Na ₂ O	0.93	9.89	1.75	1.96	0.32
K ₂ O	0.00	1.89	0.36	1.34	5.95
P ₂ O ₅	0.00	-	-	0.01	-
S	0.05	-	-	0.05	-
Cl	0.85	0.83	-	0.10	-
Sum	97.86	97.33	97.94	97.96	97.90
apfu*					
Si	7.005	6.603	6.278	7.811	7.452
Ti	0.157	0.250	0.253	0.239	0.232
Al	1.661	1.825	2.013	0.915	2.092
Fe(2+)	1.983	0.829	0.747	2.026	0.500
Fe(3+)	0.159	0.800	1.040	0.000	0.000
Mn	0.092	0.070	0.029	0.032	0.017
Mg	1.736	2.622	2.639	1.977	2.707
Ca	1.900	1.540	1.567	2.978	1.589
Na	0.275	0.533	0.662	0.622	0.091
K	0.000	0.056	0.087	0.280	1.114
P	0.220	-	-	0.001	-
S	7.005	-	-	0.013	-
Cl	0.157	0.204	-	0.028	-
X _{Ca}	0.879	0.724	0.677	0.767	0.568
X _{Al}	0.128	0.140	0.155	0.070	0.161
Al-IV	0.995	1.397	1.722	0.189	0.548
Al-VI	0.666	0.428	0.291	0.726	1.544
X _{Mg}	0.437	0.745	0.772	0.490	0.840
X _{Mn}	0.023	0.020	0.009	0.008	0.005
X _{Ti}	0.031	0.050	0.051	0.048	0.046

Note. * apfu calculated to sum (Mg + Fe + Mn + Al + Si + Ti) = 13 taking into account the sum of charges.

Synthetic clinopyroxene compositions

Elem., wt.%	7301	7320	7321	7336	7337	7368	7378	7379	7385	7386	7387
SiO ₂	48.95	46.69	44.83	54.20	49.18	50.90	52.12	53.83	50.79	55.38	55.15
TiO ₂	1.19	1.57	2.06	1.08	1.53	2.31	1.85	0.80	1.23	0.40	0.34
Al ₂ O ₃	8.15	10.09	10.36	4.24	4.09	3.24	8.46	3.14	3.87	2.61	1.70
FeO	14.01	12.94	15.01	6.11	14.52	18.25	7.81	1.87	10.18	3.29	2.70
MnO	0.40	0.38	0.18	0.05	0.25	0.17	0.14	0.22	0.38	1.28	1.57
MgO	7.89	8.61	10.10	17.25	8.31	6.05	11.12	16.30	11.72	12.19	16.30
CaO	17.14	17.75	16.62	15.51	17.96	12.27	15.43	23.30	17.89	24.33	21.28
Na ₂ O	2.15	1.00	0.49	1.23	2.27	6.71	2.89	0.27	2.72	0.49	0.88
K ₂ O	0.00	0.00	0.00	0.16	0.95	0.00	0.00	0.00	0.00	0.01	0.00
sum	99.87	99.03	99.65	99.83	99.06	99.90	99.82	99.73	98.78	99.98	99.90
apfu (calculation to 6 atoms (O) taking into account the balance of charges)											
Si	1.851	1.784	1.707	1.970	1.879	1.903	1.916	1.964	1.899	2.055	2.010
Ti	0.034	0.045	0.059	0.030	0.044	0.065	0.051	0.022	0.035	0.011	0.009
Al	0.363	0.454	0.465	0.182	0.184	0.143	0.366	0.135	0.171	0.114	0.073
Al ^{VI}	0.215	0.239	0.172	0.152	0.063	0.046	0.283	0.099	0.069	0.000	0.000
Cr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe ³⁺	0.000	0.000	0.000	0.000	0.030	0.407	0.000	0.000	0.000	0.000	0.000
Fe ²⁺	0.442	0.413	0.477	0.185	0.433	0.162	0.240	0.057	0.318	0.102	0.082
Mn	0.013	0.012	0.006	0.001	0.008	0.005	0.004	0.007	0.012	0.040	0.048
Mg	0.445	0.490	0.573	0.934	0.473	0.337	0.609	0.886	0.653	0.674	0.885
Ca	0.694	0.727	0.678	0.604	0.735	0.491	0.608	0.910	0.716	0.967	0.830
Na	0.158	0.074	0.036	0.087	0.168	0.486	0.206	0.019	0.197	0.035	0.062
K	0.000	0.000	0.000	0.007	0.046	0.000	0.000	0.000	0.000	0.000	0.000
Xmg	0.490	0.540	0.542	0.830	0.502	0.669	0.714	0.933	0.662	0.833	0.872
Jd	0.160	0.073	0.036	0.092	0.063	0.045	0.201	0.019	0.070	0.000	0.000
Ac	0.000	0.000	0.000	0.000	0.153	0.433	0.000	0.000	0.129	0.034	0.060
Aug	0.840	0.927	0.964	0.908	0.784	0.522	0.799	0.981	0.801	0.966	0.940

Synthetic feldspar compositions

	7300	7301	7320	7320	7321	7336	7336	7337	7368	7369	7378 ¹⁾
SiO ₂	54.76	63.54	65.94	59.56	58.22	66.40	62.72	62.69	69.45	64.49	66.98
TiO ₂	0.00	0.00	0.00	0.19	1.13	0.11	0.00	0.13	0.06	0.02	0.12
Al ₂ O ₃	28.47	20.42	20.18	22.19	23.42	20.82	18.33	17.96	19.26	17.54	19.92
FeO	0.92	1.36	0.59	1.94	1.33	0.03	0.00	0.36	0.58	0.05	0.25
MnO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.05	0.00	0.05
MgO	0.00	0.00	0.00	0.01	0.27	0.02	0.00	0.10	0.04	0.00	0.06
CaO	10.50	3.63	0.00	8.37	10.37	2.26	0.11	0.30	0.07	0.11	0.47
Na ₂ O	5.34	11.07	6.00	7.16	4.97	9.11	0.66	1.13	10.23	0.25	11.23
K ₂ O	0.00	0.00	7.29	0.55	0.07	0.65	17.58	16.84	0.03	17.07	0.03
BaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80
sum	99.99	100.01	100.00	99.990	99.76	99.40	99.39	99.52	99.78	99.54	99.91
apfu (calculation to 8 atoms (O))											
Si	2.469	2.830	2.954	2.699	2.855	2.889	2.955	2.892	3.194	2.997	2.954
Ti	0.000	0.000	0.000	0.007	0.042	0.004	0.000	0.005	0.002	0.001	0.004
Al	1.513	1.055	1.066	1.186	1.353	1.124	1.018	0.976	1.044	0.961	1.035
Fe	0.035	0.053	0.000	0.074	0.054	0.014	0.000	0.014	0.022	0.002	0.009
Mn	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.000	0.002
Mg	0.000	0.000	0.000	0.000	0.019	0.000	0.000	0.006	0.003	0.000	0.004
Ca	0.507	0.174	0.000	0.407	0.545	0.105	0.005	0.015	0.004	0.005	0.022
Na	0.467	0.954	0.521	0.629	0.472	0.768	0.060	0.101	0.912	0.023	0.960
K	0.000	0.000	0.417	0.032	0.004	0.036	1.056	0.991	0.002	1.012	0.002
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.014
Xal	0.380	0.275	0.265	0.305	0.321	0.280	0.256	0.252	0.246	0.243	0.259
Xca	0.521	0.154	0.000	0.381	0.534	0.116	0.005	0.013	0.004	0.005	0.022
Xna	0.479	0.846	0.555	0.589	0.462	0.844	0.054	0.091	0.993	0.022	0.962
Xk	0.000	0.000	0.445	0.030	0.004	0.040	0.941	0.896	0.003	0.973	0.002

¹⁾ in the albite (exp.7378) X_{Ba}=0.014; in the K-Ba feldspar (exp. 7379a) X_{Ba}=0.085; in the albite (exp. 7379b) X_{Ba}=0.003, in the K-feldspar X_{Ba}=0.002

Synthetic feldspar compositions (continuation)

	7379a ¹⁾	7379b	7379c	7385	7385 ¹⁾	7386	7387	7388a ¹⁾	7388b	7388c
SiO ₂	59.41	67.85	65.39	68.90	53.80	65.23	67.88	59.46	62.90	51.38
TiO ₂	0.65	0.05	0.03	0.02	0.04	0.02	0.06	0.28	0.36	0.38
Al ₂ O ₃	19.87	19.55	18.23	19.32	22.19	18.61	19.92	18.81	17.71	30.32
FeO	0.43	0.03	0.07	0.21	0.01	0.00	0.09	0.25	0.54	0.11
MnO	0.04	0.10	0.00	0.01	0.00	0.00	0.00	0.12	0.11	0.07
MgO	0.98	0.03	0.04	0.01	0.00	0.00	0.11	1.10	1.02	0.30
CaO	1.26	0.05	0.06	0.02	0.01	0.01	0.76	0.80	0.40	14.29
Na ₂ O	0.54	11.74	0.57	11.57	7.22	0.69	10.97	0.60	0.35	1.05
K ₂ O	12.65	0.20	15.55	0.00	0.02	15.42	0.08	13.23	14.78	2.01
BaO	4.38	0.15	0.11	0.00	15.94	0.00	0.00	4.86	1.19	0.11
sum	100.21	99.72	100.05	100.07	99.23	99.98	99.87	99.51	99.36	100.02
apfu (calculation to 8 atoms (O))										
Si	2.821	0.001	3.011	3.014	2.687	3.015	2.971	2.860	2.953	2.346
Ti	0.023	1.012	0.001	0.001	0.002	0.001	0.002	0.010	0.013	0.013
Al	1.112	0.001	0.989	0.996	1.306	1.013	1.027	1.066	0.980	1.633
Fe	0.017	0.004	0.003	0.008	0.000	0.000	0.003	0.010	0.021	0.004
Mn	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.005	0.004	0.003
Mg	0.069	0.002	0.003	0.001	0.000	0.000	0.007	0.079	0.071	0.020
Ca	0.064	0.999	0.003	0.001	0.001	0.001	0.035	0.041	0.021	0.699
Na	0.050	0.011	0.051	0.980	0.699	0.062	0.931	0.056	0.032	0.093
K	0.766	0.003	0.913	0.000	0.001	0.909	0.005	0.812	0.885	0.118
Ba	0.082	0.253	0.002	0.000	0.312	0.000	0.000	0.092	0.022	0.002
X _{al}	0.283	0.002	0.247	0.248	0.327	0.251	0.257	0.272	0.249	0.410
X _{ca}	0.066	0.984	0.003	0.001	0.001	0.001	0.037	0.041	0.021	0.768
X _{na}	0.052	0.011	0.053	0.999	0.690	0.064	0.959	0.056	0.033	0.102
X _k	0.796	0.011	0.942	0.000	0.001	0.936	0.005	0.811	0.924	0.128

¹⁾ in the Na-Ba feldspar (exp.7385) X_{Ba}=0.308; in the K-Ba feldspar (exp. 7388a) X_{Ba}=0.092.