

TABLE 7. CHEMICAL COMPOSITION OF HARRISONITE (HAR), LEUCOPHOSPHITE (LEU), MINERALS FROM THE ROBERTSITE (ROB) AND MITRIDATITE (MIT) SERIES, AND FERRISTRUNZITE (FRST), JOCÃO PEGMATITE, MINAS GERAIS

Mineral	Har	Leu	Leu	Leu	Phos	Phos	Phos	Phos	Phos	Rob	Mit	Frst
Samples	a	b	c	d	e	f l	g	h	i	j	k	l
Assemblage	III	II	II	II & III	I	2	II	II	III	III	III	II
Number of analyses	10	6	2	4	4		4	2	2	6	3	4
SiO ₂ wt. %	15.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.03	0.00
P ₂ O ₅	20.61	36.25	36.99	37.44	40.08	38.82	38.64	39.40	39.40	34.47	34.49	29.57
Al ₂ O ₃	0.00	0.00	0.00	0.02	4.68	0.05	0.00	0.00	0.00	0.42	0.01	0.00
Fe ₂ O ₃ *	-	41.07	36.36	36.77	37.21	41.08	42.29	42.45	42.09	1.11	22.93	44.29
FeO*	47.24	-	-	-	-	-	-	-	-	-	-	6.69
MgO	0.36	0.07	0.17	0.17	0.02	0.01	0.27	0.13	0.02	0.01	0.00	0.05
Mn ₂ O ₃ *	-	-	6.11	4.53	0.08	1.16	0.28	0.56	1.17	34.18	12.86	-
MnO*	10.33	0.21	0.65	-	0.01	-	0.28	1.16	0.00	3.75	5.30	0.40
ZnO	0.25	0.04	0.07	0.10	0.02	0.00	0.01	0.00	0.02	0.71	0.14	0.00
CaO	7.60	0.07	0.31	0.60	0.01	0.02	0.03	0.08	0.06	17.27	16.95	0.11
Na ₂ O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.09	0.00	0.00
Li ₂ O*	-	-	-	-	-	-	-	-	-	-	-	-
K ₂ O	0.00	11.17	8.76	9.46	0.00	0.03	0.16	0.33	0.06	0.02	0.02	0.06
H ₂ O**	-	11.50	11.74	11.88	20.35	19.71	19.62	20.00	20.00	8.76	8.76	24.39
Total	101.76	100.38	101.16	100.97	102.46	100.88	101.58	104.11	102.88	100.83	101.49	105,55
Si <i>apfu</i>	1.874	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.003	0.000
P	2.126	2.000	2.000	2.000	1.000	1.000	1.000	1.000	1.000	2.996	2.997	2.000
Al	0.000	0.000	0.000	0.000	0.161	0.002	0.000	0.000	0.000	0.050	0.001	0.000
Fe ³⁺	-	2.014	1.747	1.749	0.827	0.941	0.973	0.958	0.950	0.087	1.772	2.658
Fe ²⁺	4.815	-	-	-	-	-	-	-	-	-	-	0.455
Mg	0.066	0.007	0.016	0.016	0.001	0.000	0.012	0.006	0.001	0.002	0.001	0.006
Mn ³⁺	-	-	0.297	0.214	0.002	0.027	0.006	0.013	0.027	2.671	1.002	-
Mn ²⁺	1.066	0.012	0.035	-	0.000	-	0.007	0.029	-	0.326	0.463	0.027
Zn	0.022	0.002	0.003	0.005	0.000	0.000	0.000	0.000	0.000	0.053	0.010	0.000
Ca	0.992	0.005	0.021	0.041	0.000	0.001	0.001	0.003	0.002	1.899	1.863	0.009
Na	-	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.018	0.000	0.000
K	0.000	0.928	0.714	0.763	0.000	0.000	0.001	0.013	0.002	0.002	0.002	0.006
OH	-	1.000	1.000	1.000	-	-	-	-	-	-	-	3.000
Fe _{tot} /(Fe _{tot} +Mn _{tot})	0.819	-	-	-	-	-	-	-	-	0.028	0.547	0.991

- : not determined

Number of cations was calculated on the basis of 4 (P+Si) per formula unit (*p.f.u*) for harrisonite, 2 (P+Si) *p.f.u* for leucophosphite and whitmoreite, 1 (P+Si) *p.f.u* for phosphosiderite and 3 (P+Si) *p.f.u* for minerals of the robertsite-mitridatite series; * Fe³⁺ and Mn³⁺ is calculated to maintain the charge balance, ** H₂O content was calculated according to the ideal formulae. a = harrisonite, assemblage III, Joc-13a, 13c; b = fibro-radial leucophosphite, assemblage II, Joc-7, Joc-11, d = Mn²⁺-Mn³⁺-

bearing polygranular leucophosphate, assemblage II, Joc-11; d = Mn³⁺ - bearing polygranular leucophosphate, without Mn²⁺ assemblages II and III, Joc-11, Joc-13; e = colourless phosphosiderite, assemblage I, Joc-10a; f = light blue phosphosiderite, assemblage I, joc-10a; g = colourless phosphosiderite, assemblage II, Joc-7; g = blue phosphosiderite, assemblage II, Joc-11; i = blue phosphosiderite assemblage III, Joc 13a, j = Mn²⁺ and Mn³⁺ bearing robertsite, assemblage III, Joc-13a, 13c; k = Mn²⁺ and Mn³⁺ bearing mitridatite, assemblage III, Joc-13b, 13c; l = ferristrunzite, assemblage II, joc-11

TABLE 8. CHEMICAL COMPOSITION OF GREIFENSTEINITE (GREI), LUDLAMITE (LUD) AND VIVIANITE (VIV), JOCÃO PEGMATITE, MINAS GERAIS

Mineral	Grei	Grei	Lud	Viv	Viv
Samples	a	b	c	d	e
Association	I	I	I	I	I & II
Number of analyses	1	3	5	20	22
SiO ₂ wt.%	0.14	0.09	0.01	-	0.00
P ₂ O ₅	37.73	37.61	31.65	32.34	31.89
Al ₂ O ₃	0.97	0.89	0.00	0.00	0.00
Fe ₂ O ₃ *	1.19	-	-	7.52	-
FeO*	21.21	22.45	38.89	22.41	37.06
MgO	0.09	0.10	0.19	3.01	1.37
Mn ₂ O ₃ *	-	-	-	-	-
MnO*	6.71	7.07	11.60	11.00	9.54
ZnO	0.64	0.90	0.10	0.01	0.05
CaO	9.70	9.59	0.02	0.00	0.01
Na ₂ O	0.00	0.00	0.00	0.00	0.00
BeO*	8.90	8.86	-	-	-
K ₂ O	0.04	0.04	0.00	0.00	0.00
H ₂ O**	12.83	12.77	16.07	32.83	32.58
F	-	-	-	-	-
O≡F	-	-	-	-	-
Total	100.15	100.37	98.52	109.12	112.50
Si <i>apfu</i>	0.026	0.017	0.000	0.000	0.000
P	5.974	5.983	2.000	2.000	2.000
Al	0.214	0.196	0.000	0.001	0.000
Fe ³⁺	0.168	-	-	0.412	-
Fe ²⁺	3.316	3.528	2.427	1.376	2.279
Mg	0.024	0.028	0.021	0.322	0.164
Mn ³⁺	-	-	-	-	-
Mn ²⁺	1.063	1.126	0.733	0.680	0.606
Zn	0.089	0.124	0.006	0.000	0.003
Ca	1.944	1.932	0.002	0.000	0.001
Na	0.000	0.000	0.000	0.000	0.000
Be	4.000	4.000	-	-	-
K	0.009	0.008	0.000	0.000	0.000
F	-	-	-	-	-

OH	4.000	4.000	-	-	0.101
----	-------	-------	---	---	-------

- : not determined

Number of cations was calculated on the basis of 6 (P+Si) per formula unit (*p.f.u*) for greifensteinite, 2 (P+Si) *p.f.u* for vivianite and ludlamite,; * Fe³⁺ and Mn³⁺ is calculated to maintain the charge balance, ** H₂O content was calculated according to the ideal formulae.

a = Fe³⁺-bearing greifensteinite, assemblage I, sample Joc-2; b = Fe³⁺-free greifensteinite, assemblage I, sample Joc-2; c = ludlamite, assemblage I, Joc-3; d = Fe³⁺-bearing vivianite, assemblage I, samples PU076, PS-071, CIG-26-07, CIG-1, e = Vivianite, assemblage I and II, samples Joc-3, 7, 8, 9, 10, 11