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OXYGEN FUGACITY OF THE ALTO PARANAÍBA KIMBERLITES AND DIAMOND INSTABILITY: TRÊS RANCHOS IV AND LIMEIRA I INTRUSIONS

Bruna Coldebella, Rogério Guitarrari Azzone, Luanna Chmyz, Excelso Ruberti, Darcy P. Svisero

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Supplementary Material B

Table B1 - Calibration routines and standards for each element and mineral analysed by electron microprobe.

Element	X-ray line	Crystal	Standards Olivine/monticellite[1]	Standards Perovskite[2]	Standards Ilmenite[1]	Standards Pyroxene[1]
Si	Kα	TAP	diopside	anorthite	diopside	olivine
Al	Kα	TAP	anorthite_%ele		Spinel_%ele	microcline
Fe	Kα	LIFL	fayalite	ilmenite	ilmenite	fayalite
Mn	Kα	LIFL	fayalite		fayalite	$MnTiO_3$
K	Kα	PETJ	Ortoclase		Ortoclase	
Ca	Kα	PETJ	Wollastonite	Wollastonite	Wollastonite	Wollastonite
Sr	Lα	PETJ		strontianite		
Ti	Kα	LIFL	Rutile	Rutile	ilmenite	$MnTiO_3$
Ba	Lα	LIFL		benitoite		$MnTiO_3$
Na	Kα	TAPH	Albite	Albite	Albite	Albite
Mg	Kα	TAPH	basalt_#8		diopside	olivine
Ni	Kα	LIFL	glass_rhyolitic_#37		glass_rhyolitic_ #37	NiO
Cr	Kα	LIFL	chromite_%ele		chromite_%ele	Cr_2O_3
Zn	Kα	LIFL			Willemite	
Nb	Lα	PETJ		ilmenite	ilmenite	
Nd	Lα	LIFL		neodymium-phosphate		
La	Lα	LIFL		lanthanium-phosphate		
Sm	Lα	LIFL		samarium-phosphate		
Pr	Lβ	LIFL		praseodymium-phosphate		
Zr	Lα	PETJ		zircon		
Th	Mα	PETJ		glass rhyolitic #32		
Ce	Lα	LIFL		cerium-phosphate		

[1]15.0 kV, 20nA

[2]25.0 kV, 100 nA

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Supplementary Material B

TABELA B2 - Major element concentration of olivine from all samples. Structural formula calculated on the basis of 4 oxygens .

C - core; R - rim; I - intermediate; mega - megacrystals, macro - macrocrysts, micro - microcrysts.

Sample	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2
Grain/Analysis	01/01	01/02	02/03	02/04	03/05	03/06	04/07	04/08	05/09	05/10	06/11	06/12	07/13	07/14	08/15
Location	C	R	C	R	C	R	R	C	C	R	C	R	C	R	C
Crystal type	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*macro*	*macro*	*macro*	*macro*	*micro*	*micro*	*micro*	*micro*	*macro*
SiO_2	40.17	40.46	40.61	40.40	40.19	39.86	39.71	40.66	40.23	39.82	40.63	40.04	40.45	40.16	40.06
Al_2O_3	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.05	0.04	0.00
FeO	8.50	9.67	10.04	10.31	9.89	13.50	13.33	10.13	11.78	13.61	9.57	12.77	10.37	10.38	12.51
MnO	0.16	0.15	0.15	0.14	0.17	0.21	0.21	0.15	0.17	0.19	0.16	0.21	0.11	0.12	0.24
NiO	0.39	0.39	0.35	0.41	0.36	0.20	0.21	0.38	0.34	0.24	0.39	0.16	0.44	0.46	0.33
CaO	0.02	0.02	0.01	0.01	0.02	0.06	0.07	0.05	0.02	0.09	0.01	0.05	0.13	0.14	0.02
K_2O	0.01	0.00	0.00	0.00	0.01	0.01	0.02	0.00	0.00	0.01	0.02	0.00	0.00	0.02	0.00
TiO_2	0.00	0.03	0.00	0.00	0.00	0.02	0.02	0.00	0.04	0.09	0.01	0.00	0.06	0.02	0.00
Cr_2O_3	0.01	0.00	0.08	0.00	0.00	0.00	0.05	0.03	0.00	0.10	0.00	0.01	0.06	0.12	0.00
MgO	50.34	49.19	48.79	48.96	48.94	46.02	46.21	48.72	47.57	45.89	49.62	46.80	48.53	48.73	47.32
Na_2O	0.01	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.01	0.02	0.00	0.01	0.00	0.01	0.00
Total:	**99.60**	**99.92**	**100.06**	**100.22**	**99.58**	**99.89**	**99.83**	**100.12**	**100.17**	**100.06**	**100.41**	**100.07**	**100.20**	**100.20**	**100.47**
Si	0.986	0.994	0.997	0.992	0.992	0.996	0.993	0.998	0.995	0.995	0.993	0.995	0.994	0.988	0.992
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000
Fe	0.174	0.199	0.206	0.212	0.204	0.282	0.279	0.208	0.244	0.284	0.196	0.265	0.213	0.214	0.259
Mn	0.003	0.003	0.003	0.003	0.004	0.004	0.005	0.003	0.003	0.004	0.003	0.004	0.002	0.003	0.005
Ni	0.008	0.008	0.007	0.008	0.007	0.004	0.004	0.008	0.007	0.005	0.008	0.003	0.009	0.009	0.006
Ca	0.000	0.001	0.000	0.000	0.001	0.002	0.002	0.001	0.000	0.002	0.000	0.001	0.003	0.004	0.001
K	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.000
Ti	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.000	0.000	0.001	0.000	0.000
Cr	0.000	0.000	0.002	0.000	0.000	0.000	0.001	0.001	0.000	0.002	0.000	0.000	0.001	0.002	0.000
Mg	1.842	1.801	1.786	1.792	1.800	1.714	1.722	1.783	1.754	1.709	1.807	1.734	1.778	1.788	1.746
Na	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000
Cations:	**3.014**	**3.006**	**3.002**	**3.008**	**3.008**	**3.004**	**3.007**	**3.002**	**3.004**	**3.003**	**3.007**	**3.005**	**3.003**	**3.010**	**3.009**
Fayalite	0.09	0.10	0.10	0.11	0.10	0.14	0.14	0.10	0.12	0.14	0.10	0.13	0.11	0.11	0.13
Forsterite	0.91	0.90	0.90	0.89	0.90	0.86	0.86	0.90	0.88	0.86	0.90	0.87	0.89	0.89	0.87

Supplementary Material B

TABELA B2 - Major element concentration of olivine from all samples. Structural formula calculated on the basis of 4 oxygens .

C - core; R - rim; I - intermediate; mega - megacrystals, macro - macrocrysts, micro - microcrysts.

Sample	LM-2	LM-2	LM-2	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1
Grain/Analysis	08/16	09/17	09/18	10/19	10/20	11/21	11/22	12/23	12/24	13/25	13/26	14/27	14/28	15/29	15/30
Location	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R
Crystal type	*macro*	*micro*	*micro*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*macro*	*macro*	*macro*	*macro*	*macro*	*macro*
SiO_2	40.07	40.20	40.45	40.32	39.55	40.90	41.10	40.20	40.36	40.73	40.22	39.93	40.47	39.89	40.25
Al_2O_3	0.00	0.04	0.04	0.00	0.00	0.01	0.00	0.02	0.01	0.01	0.00	0.05	0.05	0.00	0.00
FeO	12.43	11.65	11.61	10.10	12.22	7.46	7.53	12.18	11.79	8.18	13.91	11.29	10.89	13.15	13.01
MnO	0.22	0.15	0.16	0.18	0.17	0.12	0.13	0.16	0.16	0.10	0.20	0.13	0.16	0.15	0.22
NiO	0.33	0.39	0.37	0.40	0.29	0.35	0.37	0.31	0.36	0.37	0.19	0.39	0.40	0.34	0.31
CaO	0.04	0.15	0.13	0.01	0.02	0.04	0.03	0.07	0.05	0.01	0.08	0.11	0.14	0.03	0.08
K_2O	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.00
TiO_2	0.05	0.06	0.00	0.01	0.03	0.01	0.05	0.02	0.00	0.00	0.02	0.06	0.03	0.04	0.03
Cr_2O_3	0.01	0.09	0.08	0.00	0.03	0.03	0.01	0.00	0.00	0.01	0.04	0.11	0.08	0.01	0.02
MgO	47.15	47.54	47.46	49.29	48.12	51.20	50.91	47.50	47.15	51.15	45.79	48.22	47.90	47.18	46.37
Na_2O	0.01	0.03	0.02	0.02	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.02	0.01	0.00
Total:	**100.32**	**100.30**	**100.32**	**100.33**	**100.42**	**100.13**	**100.14**	**100.46**	**99.91**	**100.55**	**100.45**	**100.32**	**100.16**	**100.80**	**100.29**
Si	0.993	0.993	0.998	0.989	0.979	0.992	0.997	0.993	1.000	0.988	1.000	0.986	0.997	0.987	0.999
Al	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.002	0.001	0.000	0.000
Fe	0.258	0.241	0.240	0.207	0.253	0.151	0.153	0.252	0.244	0.166	0.289	0.233	0.224	0.272	0.270
Mn	0.005	0.003	0.003	0.004	0.004	0.002	0.003	0.003	0.003	0.002	0.004	0.003	0.003	0.003	0.005
Ni	0.007	0.008	0.007	0.008	0.006	0.007	0.007	0.006	0.007	0.007	0.004	0.008	0.008	0.007	0.006
Ca	0.001	0.004	0.004	0.000	0.001	0.001	0.001	0.002	0.001	0.000	0.002	0.003	0.004	0.001	0.002
K	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000
Ti	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001
Cr	0.000	0.002	0.002	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.002	0.000	0.000
Mg	1.742	1.751	1.746	1.802	1.776	1.852	1.841	1.749	1.742	1.849	1.698	1.774	1.760	1.741	1.716
Na	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.000	0.000
Cations:	**3.006**	**3.005**	**3.001**	**3.012**	**3.020**	**3.007**	**3.002**	**3.006**	**3.000**	**3.012**	**2.999**	**3.012**	**3.001**	**3.012**	**3.000**
Fayalite	0.13	0.12	0.12	0.10	0.12	0.08	0.08	0.13	0.12	0.08	0.15	0.12	0.11	0.14	0.14
Forsterite	0.87	0.88	0.88	0.90	0.88	0.92	0.92	0.87	0.88	0.92	0.85	0.88	0.89	0.86	0.86

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Supplementary Material B

TABELA B2 - Major element concentration of olivine from all samples. Structural formula calculated on the basis of 4 oxygens .

C - core; R - rim; I - intermediate; mega - megacrystals, macro - macrocrysts, micro - microcrysts.

Sample	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2
Grain/Analysis	16/31	16/32	17/33	17/34	18/35	18/36	19/37	19/38	20/39	20/40	21/41	21/42	22/43	22/44	23/45	23/46	24/47
Location	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C
Crystal type	*micro*	*micro*	*micro*	*micro*	*micro*	*micro*	*mega*	*mega*	*micro*	*micro*	*mega*	*mega*	*mega*	*mega*	*macro*	*macro*	*macro*
SiO_2	39.86	39.91	39.99	40.18	40.79	40.38	39.77	39.91	40.58	39.69	40.26	40.20	40.53	39.57	39.88	39.59	39.12
Al_2O_3	0.02	0.01	0.01	0.02	0.01	0.00	0.02	0.02	0.01	0.01	0.00	0.01	0.00	0.02	0.00	0.00	0.01
FeO	12.31	12.48	11.57	13.78	8.43	8.22	12.79	12.76	10.29	13.39	11.41	13.45	7.72	13.55	13.57	13.31	16.01
MnO	0.15	0.15	0.16	0.18	0.13	0.13	0.14	0.15	0.15	0.19	0.17	0.20	0.09	0.22	0.16	0.18	0.22
NiO	0.40	0.40	0.36	0.23	0.38	0.38	0.43	0.43	0.36	0.36	0.36	0.19	0.36	0.19	0.24	0.22	0.17
CaO	0.06	0.07	0.04	0.14	0.01	0.00	0.06	0.06	0.06	0.09	0.04	0.11	0.01	0.09	0.04	0.05	0.01
K_2O	0.01	0.01	0.00	0.01	0.00	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.03	0.01	0.00	0.01	0.00
TiO_2	0.00	0.03	0.04	0.02	0.00	0.02	0.05	0.00	0.03	0.00	0.00	0.06	0.03	0.01	0.00	0.05	0.02
Cr_2O_3	0.02	0.06	0.01	0.08	0.00	0.00	0.00	0.01	0.01	0.04	0.01	0.08	0.03	0.05	0.00	0.02	0.00
MgO	46.85	47.51	48.06	45.08	50.77	51.48	46.77	46.90	49.05	45.88	48.32	46.28	51.31	47.09	46.75	46.84	44.85
Na_2O	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.01	0.01	0.02	0.00	0.00	0.01	0.00	0.00
Total:	**99.70**	**100.64**	**100.24**	**99.72**	**100.51**	**100.62**	**100.06**	**100.28**	**100.54**	**99.67**	**100.59**	**100.59**	**100.12**	**100.80**	**100.67**	**100.28**	**100.41**
Si	0.994	0.987	0.988	1.006	0.990	0.980	0.990	0.991	0.993	0.995	0.990	0.997	0.986	0.982	0.990	0.986	0.985
Al	0.001	0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
Fe	0.257	0.258	0.239	0.289	0.171	0.167	0.266	0.265	0.211	0.281	0.235	0.279	0.157	0.281	0.282	0.277	0.337
Mn	0.003	0.003	0.003	0.004	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.002	0.005	0.003	0.004	0.005
Ni	0.008	0.008	0.007	0.005	0.007	0.007	0.009	0.009	0.007	0.007	0.007	0.004	0.007	0.004	0.005	0.004	0.003
Ca	0.002	0.002	0.001	0.004	0.000	0.000	0.002	0.002	0.001	0.002	0.001	0.003	0.000	0.003	0.001	0.001	0.000
K	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Ti	0.000	0.001	0.001	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.000
Cr	0.000	0.001	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.002	0.000	0.001	0.000	0.000	0.000
Mg	1.741	1.751	1.770	1.683	1.837	1.862	1.736	1.737	1.789	1.714	1.772	1.711	1.860	1.742	1.729	1.739	1.683
Na	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Cations:	**3.006**	**3.012**	**3.011**	**2.993**	**3.009**	**3.020**	**3.009**	**3.009**	**3.006**	**3.005**	**3.010**	**3.001**	**3.014**	**3.017**	**3.011**	**3.013**	**3.014**
Fayalite	0.13	0.13	0.12	0.15	0.09	0.08	0.13	0.13	0.11	0.14	0.12	0.14	0.08	0.14	0.14	0.14	0.17
Forsterite	0.87	0.87	0.88	0.85	0.91	0.92	0.87	0.87	0.89	0.86	0.88	0.86	0.92	0.86	0.86	0.86	0.83

Supplementary Material B

TABELA B2 - Major element concentration of olivine from all samples. Structural formula calculated on the basis of 4 oxygens .

C - core; R - rim; I - intermediate; mega - megacrystals, macro - macrocrysts, micro - microcrysts.

Sample	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LMI-B1	LMI-B1	LMI-B1	LMI-B1	LMI-B1	LMI-B1	LMI-B1	LMI-B1	LMI-B1	LMI-B1
Grain/Analysis	24/48	25/49	25/50	26/51	26/52	27/53	27/54	28/55	28/56	29/57	29/58	30/59	30/60	31/61	31/62
Location	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R
Crystal type	*macro*	*micro*	*micro*	*macro*	*macro*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*
SiO_2	39.07	40.65	39.88	39.38	38.81	40.33	39.83	40.50	40.77	40.53	40.39	40.75	40.49	40.66	40.81
Al_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.02
FeO	12.89	9.66	12.75	16.60	16.56	11.93	12.74	8.27	8.15	9.68	10.82	9.02	11.10	9.42	9.40
MnO	0.19	0.14	0.20	0.24	0.22	0.18	0.19	0.11	0.12	0.15	0.16	0.12	0.15	0.13	0.14
NiO	0.23	0.37	0.22	0.27	0.28	0.33	0.31	0.37	0.35	0.38	0.38	0.35	0.40	0.39	0.43
CaO	0.41	0.03	0.07	0.03	0.04	0.00	0.03	0.00	0.00	0.01	0.01	0.02	0.01	0.02	0.03
K_2O	0.00	0.01	0.04	0.02	0.02	0.01	0.00	0.04	0.01	0.00	0.00	0.00	0.00	0.02	0.01
TiO_2	0.03	0.00	0.00	0.00	0.02	0.04	0.00	0.04	0.00	0.00	0.00	0.00	0.02	0.03	0.02
Cr_2O_3	0.00	0.00	0.03	0.00	0.05	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.00	0.02	0.00
MgO	47.50	49.80	46.70	43.94	44.11	48.03	47.53	50.83	50.14	49.51	48.51	50.10	48.59	50.03	49.16
Na_2O	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.14
Total:	**100.32**	**100.67**	**99.90**	**100.47**	**100.14**	**100.85**	**100.64**	**100.17**	**99.55**	**100.29**	**100.30**	**100.40**	**100.75**	**100.72**	**100.15**
Si	0.973	0.991	0.994	0.993	0.984	0.991	0.986	0.987	0.997	0.992	0.993	0.993	0.992	0.990	0.999
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.269	0.197	0.266	0.350	0.351	0.245	0.264	0.169	0.167	0.198	0.223	0.184	0.228	0.192	0.192
Mn	0.004	0.003	0.004	0.005	0.005	0.004	0.004	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.003
Ni	0.005	0.007	0.004	0.005	0.006	0.007	0.006	0.007	0.007	0.008	0.008	0.007	0.008	0.008	0.009
Ca	0.011	0.001	0.002	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001
K	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000
Ti	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000
Cr	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
Mg	1.764	1.810	1.735	1.652	1.667	1.760	1.753	1.846	1.829	1.806	1.779	1.820	1.776	1.816	1.793
Na	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
Cations:	**3.026**	**3.009**	**3.007**	**3.007**	**3.016**	**3.008**	**3.014**	**3.013**	**3.003**	**3.008**	**3.006**	**3.007**	**3.007**	**3.010**	**3.004**
Fayalite	0.13	0.10	0.13	0.17	0.17	0.961	1.000	1.000	1.000	0.896	1.000	0.943	1.000	1.000	0.303
Forsterite	0.87	0.90	0.87	0.83	0.83	0.039	0.000	0.000	0.000	0.104	0.000	0.057	0.000	0.000	0.697

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Bruna Coldebella, Rogério Guitarrari Azzone, Luanna Chmyz, Excelso Ruberti, Darcy P. Svisero

Supplementary Material B

TABELA B2 - Major element concentration of olivine from all samples. Structural formula calculated on the basis of 4 oxygens .

C - core; R - rim; I - intermediate; mega - megacrystals, macro - macrocrysts, micro - microcrysts.

Sample	LMI-C1	LMI-C1	LMI-C1	LMI-C1	LMI-C2	LMI-C2	LMI-C2	LMI-C2	TR-4	TR-4	TR-4	TR-4	TR-4	TR-4	TR-4	TR-4	TR-4
Grain/Analysis	33/65	33/66	34/67	34/68	36/71	36/72	37/73	37/74	01/01	01/02	02/03	02/04	03/05	03/06	04/07	04/08	05/09
Location	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C
Crystal type	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*micro*	*micro*	*macro*	*macro*	*micro*	*micro*	*micro*
SiO_2	40.72	39.55	40.40	40.22	40.54	39.55	40.16	41.26	41.04	40.75	41.38	41.63	40.86	39.97	40.48	41.10	39.29
Al_2O_3	0.01	0.00	0.01	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.01	0.04
FeO	11.40	11.26	11.55	11.30	8.98	9.22	12.40	12.83	8.06	7.89	8.19	8.03	8.02	8.03	8.46	8.63	13.53
MnO	0.18	0.20	0.18	0.18	0.14	0.16	0.16	0.17	0.12	0.09	0.08	0.09	0.11	0.09	0.11	0.11	0.14
NiO	0.41	0.40	0.34	0.33	0.38	0.37	0.36	0.35	0.35	0.37	0.38	0.39	0.36	0.39	0.42	0.40	0.38
CaO	0.02	0.01	0.02	0.01	0.02	0.03	0.03	0.04	0.00	0.00	0.03	0.04	0.00	0.04	0.03	0.02	0.07
K_2O	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
TiO_2	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.01	0.00	0.00	0.00	0.00	0.05	0.04	0.00	0.00	0.00
Cr_2O_3	0.02	0.00	0.05	0.03	0.00	0.01	0.03	0.04	0.02	0.01	0.03	0.00	0.00	0.00	0.03	0.01	0.02
MgO	48.21	49.38	48.36	49.29	49.63	50.82	47.00	45.06	50.38	50.39	49.64	48.70	50.25	51.58	49.74	49.46	46.19
Na_2O	0.00	0.02	0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.02
Total:	**100.97**	**100.84**	**100.93**	**101.36**	**99.72**	**100.20**	**100.17**	**99.77**	**100.00**	**99.50**	**99.74**	**98.89**	**99.65**	**100.13**	**99.26**	**99.75**	**99.67**
Si	0.997	0.973	0.991	0.982	0.994	0.970	0.996	1.025	0.999	0.996	1.009	1.021	0.998	0.975	0.995	1.005	0.986
Al	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Fe	0.233	0.232	0.237	0.231	0.184	0.189	0.257	0.267	0.164	0.161	0.167	0.165	0.164	0.164	0.174	0.176	0.284
Mn	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003
Ni	0.008	0.008	0.007	0.006	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.007	0.008	0.008	0.008	0.008
Ca	0.001	0.000	0.001	0.000	0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.001	0.000	0.001	0.001	0.001	0.002
K	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ti	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000
Cr	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000
Mg	1.760	1.810	1.768	1.794	1.815	1.858	1.738	1.669	1.828	1.837	1.804	1.781	1.829	1.875	1.823	1.803	1.728
Na	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Cations:	**3.003**	**3.028**	**3.009**	**3.018**	**3.005**	**3.030**	**3.003**	**2.975**	**3.001**	**3.004**	**2.991**	**2.978**	**3.001**	**3.025**	**3.004**	**2.995**	**3.014**
Fayalite	1.000	0.818	0.933	0.932	1.000	0.843	0.948	0.873	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.14
Forsterite	0.000	0.182	0.067	0.068	0.000	0.157	0.052	0.127	0.92	0.92	0.92	0.92	0.92	0.92	0.91	0.91	0.86

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Bruna Coldebella, Rogério Guitarrari Azzone, Luanna Chmyz, Excelso Ruberti, Darcy P. Svisero

Supplementary Material B

TABELA B2 - Major element concentration of olivine from all samples. Structural formula calculated on the basis of 4 oxygens .

C - core; R - rim; I - intermediate; mega - megacrystals, macro - macrocrysts, micro - microcrysts.

Sample	TR-4	TR-4	TR-4	TR-4	TR-4	TR-4	TR-4	TR-4	TR-4	TR-4	TR-4	TR4-1	TR4-1	TR4-1	TR4-1	TR4-1	TR4-1	TR4-1
Grain/Analysis	05/10	06/11	06/12	07/13	07/14	08/15	08/16	09/17	09/18	10/19	10/20	11/21	11/22	12/23	12/24	13/25	13/26	14/27
Location	R	C	R	C	R	R	C	C	R	C	R	C	R	C	R	C	R	C
Crystal type	*micro*	*micro*	*micro*	*mega*	*mega*	*mega*	*mega*	*macro*	*macro*	*macro*	*macro*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*micro*
SiO_2	40.18	41.21	42.15	41.03	41.16	40.68	40.74	41.13	41.43	40.70	41.40	40.16	40.01	40.72	39.82	40.34	40.42	39.62
Al_2O_3	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
FeO	13.47	8.11	8.10	8.38	8.38	9.41	9.36	8.60	8.36	8.38	8.16	8.85	9.11	7.68	11.24	7.96	8.29	12.75
MnO	0.13	0.11	0.11	0.11	0.11	0.14	0.13	0.09	0.10	0.12	0.11	0.14	0.12	0.12	0.18	0.09	0.11	0.19
NiO	0.38	0.41	0.39	0.39	0.40	0.37	0.39	0.42	0.39	0.39	0.41	0.33	0.32	0.43	0.34	0.37	0.39	0.27
CaO	0.08	0.03	0.01	0.01	0.02	0.08	0.07	0.02	0.01	0.00	0.01	0.00	0.01	0.00	0.04	0.03	0.04	0.02
K_2O	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.03	0.01	0.01	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.01
TiO_2	0.04	0.00	0.01	0.00	0.00	0.06	0.00	0.03	0.00	0.00	0.03	0.04	0.06	0.00	0.04	0.02	0.00	0.01
Cr_2O_3	0.02	0.04	0.00	0.01	0.00	0.03	0.02	0.03	0.00	0.03	0.02	0.04	0.01	0.01	0.02	0.03	0.03	0.01
MgO	45.40	49.97	49.27	49.82	48.88	48.72	49.29	49.65	48.63	49.96	49.75	49.46	49.54	50.46	47.36	50.59	49.71	46.49
Na_2O	0.04	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.01	0.01	0.00	0.00	0.02	0.01	0.02	0.01	0.02
Total:	**99.78**	**99.88**	**100.05**	**99.78**	**98.97**	**99.53**	**100.02**	**100.01**	**98.99**	**99.61**	**99.92**	**99.03**	**99.19**	**99.44**	**99.06**	**99.48**	**99.01**	**99.38**
Si	1.005	1.004	1.022	1.002	1.012	1.001	0.998	1.003	1.018	0.997	1.008	0.992	0.988	0.996	0.994	0.988	0.996	0.993
Al	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.282	0.165	0.164	0.171	0.172	0.194	0.192	0.175	0.172	0.172	0.166	0.183	0.188	0.157	0.235	0.163	0.171	0.267
Mn	0.003	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.004	0.002	0.002	0.004
Ni	0.008	0.008	0.008	0.008	0.008	0.007	0.008	0.008	0.008	0.008	0.008	0.007	0.006	0.008	0.007	0.007	0.008	0.005
Ca	0.002	0.001	0.000	0.000	0.000	0.002	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.000
K	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000
Ti	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000
Cr	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.001	0.001	0.000
Mg	1.692	1.814	1.781	1.814	1.792	1.787	1.800	1.805	1.781	1.824	1.805	1.821	1.824	1.840	1.763	1.848	1.825	1.736
Na	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.000	0.001
Cations:	**2.995**	**2.996**	**2.978**	**2.998**	**2.988**	**2.997**	**3.002**	**2.997**	**2.983**	**3.003**	**2.992**	**3.007**	**3.011**	**3.004**	**3.005**	**3.012**	**3.004**	**3.008**
Fayalite	0.14	0.08	0.08	0.09	0.09	0.10	0.10	0.09	0.09	0.09	0.08	0.09	0.09	0.08	0.12	0.08	0.09	0.13
Forsterite	0.86	0.92	0.92	0.91	0.91	0.90	0.90	0.91	0.91	0.91	0.92	0.91	0.91	0.92	0.88	0.92	0.91	0.87

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Supplementary Material B

TABELA B2 - Major element concentration of olivine from all samples. Structural formula calculated on the basis of 4 oxygens .

C - core; R - rim; I - intermediate; mega - megacrystals, macro - macrocrysts, micro - microcrysts.

Sample	TR4-1	TR4-1	TR4-1	TR4-1	TR4-1	TR4-1	TR4-1	TR4-1	TR4-1	TR4-2	TR4-2	TR4-2	TR4-2	TR4-2	TR4-2	TR4-2	TR4-2	TR4-2
Grain/Analysis	14/28	15/29	15/30	16/31	16/32	17/33	17/34	18/35	18/36	19/37	19/38	20/39	20/40	21/41	21/42	22/43	22/44	23/45
Location	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C
Crystal type	*micro*	*macro*	*macro*	*micro*	*micro*	*micro*	*micro*	*macro*	*macro*	*mega*	*mega*	*mega*	*mega*	*macro*	*macro*	*macro*	*macro*	*micro*
SiO_2	39.50	40.81	40.45	40.29	40.53	40.11	39.70	40.17	39.94	41.06	40.53	40.84	41.49	40.03	39.40	41.07	40.57	40.87
Al_2O_3	0.01	0.00	0.00	0.02	0.01	0.00	0.01	0.04	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.01
FeO	12.98	8.24	8.24	8.41	8.48	10.44	12.18	8.96	9.76	7.79	7.71	8.22	8.11	11.63	11.11	7.93	7.87	8.32
MnO	0.20	0.08	0.12	0.12	0.11	0.16	0.18	0.12	0.16	0.09	0.11	0.10	0.13	0.13	0.14	0.10	0.10	0.09
NiO	0.28	0.38	0.37	0.36	0.38	0.36	0.34	0.36	0.36	0.42	0.42	0.39	0.42	0.40	0.42	0.43	0.40	0.36
CaO	0.03	0.03	0.02	0.01	0.06	0.02	0.08	0.01	0.02	0.00	0.04	0.00	0.03	0.01	0.01	0.03	0.04	0.00
K_2O	0.02	0.00	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01
TiO_2	0.00	0.00	0.01	0.04	0.00	0.00	0.03	0.00	0.00	0.02	0.00	0.01	0.03	0.03	0.04	0.00	0.01	0.00
Cr_2O_3	0.00	0.02	0.02	0.00	0.03	0.06	0.08	0.00	0.02	0.01	0.00	0.00	0.00	0.01	0.02	0.01	0.02	0.01
MgO	46.80	50.07	50.16	50.12	49.80	47.65	46.73	49.41	49.17	51.34	51.91	51.28	50.40	48.47	49.01	51.18	52.00	50.87
Na_2O	0.01	0.00	0.00	0.00	0.00	0.00	0.04	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.01	0.02	0.01
Total:	**99.83**	**99.64**	**99.39**	**99.38**	**99.42**	**98.80**	**99.39**	**99.07**	**99.46**	**100.74**	**100.71**	**100.84**	**100.63**	**100.71**	**100.14**	**100.75**	**101.05**	**100.54**
Si	0.987	0.998	0.993	0.990	0.995	1.000	0.993	0.992	0.987	0.992	0.980	1.003	0.985	0.975	0.992	0.979	0.991	1.007
Al	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.271	0.168	0.169	0.173	0.174	0.218	0.255	0.185	0.202	0.157	0.156	0.164	0.239	0.230	0.160	0.159	0.169	0.172
Mn	0.004	0.002	0.002	0.003	0.002	0.003	0.004	0.003	0.003	0.002	0.002	0.003	0.003	0.003	0.002	0.002	0.002	0.003
Ni	0.006	0.008	0.007	0.007	0.008	0.007	0.007	0.007	0.007	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.007	0.007
Ca	0.001	0.001	0.001	0.000	0.002	0.000	0.002	0.000	0.001	0.000	0.001	0.001	0.000	0.000	0.001	0.001	0.000	0.000
K	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ti	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Cr	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mg	1.743	1.825	1.835	1.835	1.823	1.770	1.742	1.819	1.811	1.848	1.872	1.816	1.778	1.807	1.843	1.870	1.839	1.803
Na	0.001	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
Cations:	**3.013**	**3.002**	**3.007**	**3.010**	**3.005**	**3.000**	**3.007**	**3.008**	**3.013**	**3.008**	**3.020**	**2.996**	**3.014**	**3.025**	**3.008**	**3.021**	**3.009**	**2.992**
Fayalite	0.13	0.08	0.08	0.09	0.09	0.11	0.13	0.09	0.10	0.08	0.08	0.08	0.12	0.11	0.08	0.08	0.08	0.09
Forsterite	0.87	0.92	0.92	0.91	0.91	0.89	0.87	0.91	0.90	0.92	0.92	0.92	0.88	0.89	0.92	0.92	0.92	0.91

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OXYGEN FUGACITY OF THE ALTO PARANAÍBA KIMBERLITES AND DIAMOND INSTABILITY: TRÊS RANCHOS IV AND LIMEIRA I INTRUSIONS
Bruna Coldebella, Rogério Guitarrari Azzone, Luanna Chmyz, Excelso Ruberti, Darcy P. Svisero

Supplementary Material B

TABELA B2 - Major element concentration of olivine from all samples. Structural formula calculated on the basis of 4 oxygens .

C - core; R - rim; I - intermediate; mega - megacrystals, macro - macrocrysts, micro - microcrysts.

Sample	TR4-2	TR4-2	TR4-2	TRIV-5	TRIV-5	TRIV-5	TRIV-5	TRIV-5	TRIV-5	TRIV-5	TRIV-5	TRIV-5-3	TRIV-5-3	TRIV-5-3	TRIV-5-3
Grain/Analysis	23/46	24/47	24/48	25/49	25/50	26/51	26/52	27/53	27/54	28/55	28/56	29/57	29/58	30/59	30/60
Location	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R
Crystal type	*micro*	*micro*	*micro*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*
SiO_2	41.46	40.85	41.84	40.79	40.41	40.77	41.39	40.80	40.77	40.96	41.64	39.25	39.33	40.61	41.24
Al_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.03	0.03	0.01	0.00
FeO	8.46	8.45	8.35	9.26	8.91	8.88	8.86	11.06	11.20	8.49	8.68	15.73	15.64	8.57	8.36
MnO	0.13	0.09	0.12	0.13	0.09	0.10	0.11	0.18	0.22	0.12	0.09	0.17	0.15	0.13	0.10
NiO	0.37	0.43	0.39	0.39	0.38	0.39	0.36	0.31	0.35	0.40	0.36	0.36	0.36	0.42	0.40
CaO	0.01	0.02	0.08	0.01	0.02	0.01	0.03	0.03	0.03	0.01	0.01	0.07	0.06	0.00	0.03
K_2O	0.00	0.01	0.00	0.02	0.01	0.01	0.00	0.00	0.02	0.01	0.03	0.01	0.00	0.00	0.00
TiO_2	0.01	0.01	0.05	0.00	0.00	0.06	0.02	0.02	0.04	0.03	0.03	0.04	0.05	0.02	0.00
Cr_2O_3	0.02	0.00	0.00	0.02	0.00	0.01	0.02	0.03	0.00	0.05	0.03	0.04	0.03	0.06	0.00
MgO	49.78	50.93	48.60	49.88	49.86	50.15	49.75	48.32	47.99	50.28	49.26	44.63	45.15	50.29	49.94
Na_2O	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.03	0.03	0.00	0.00
Total:	**100.24**	**100.79**	**99.42**	**100.51**	**99.70**	**100.38**	**100.55**	**100.75**	**100.64**	**100.37**	**100.12**	**100.35**	**100.82**	**100.09**	**100.07**
Si	0.989	1.022	0.987	0.994	0.991	0.993	1.004	0.999	1.000	0.996	1.013	0.988	0.985	0.991	1.004
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000
Fe	0.171	0.171	0.182	0.189	0.183	0.181	0.180	0.226	0.230	0.173	0.177	0.331	0.328	0.175	0.170
Mn	0.002	0.002	0.003	0.003	0.002	0.002	0.002	0.004	0.005	0.003	0.002	0.004	0.003	0.003	0.002
Ni	0.008	0.008	0.000	0.008	0.008	0.008	0.007	0.006	0.007	0.008	0.007	0.007	0.007	0.008	0.008
Ca	0.001	0.002	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.000	0.000	0.002	0.002	0.000	0.001
K	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Ti	0.000	0.001	0.001	0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.000	0.000
Cr	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.000
Mg	1.839	1.770	1.830	1.812	1.824	1.821	1.800	1.764	1.755	1.822	1.786	1.675	1.686	1.830	1.812
Na	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.002	0.000	0.000
Cations:	**3.011**	**2.977**	**3.009**	**3.006**	**3.009**	**3.006**	**2.995**	**3.001**	**2.999**	**3.003**	**2.987**	**3.011**	**3.014**	**3.008**	**2.996**
Fayalite	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.11	0.12	0.09	0.09	0.17	0.16	0.09	0.09
Forsterite	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.89	0.88	0.91	0.91	0.83	0.84	0.91	0.91

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Bruna Coldebella, Rogério Guitarrari Azzone, Luanna Chmyz, Excelso Ruberti, Darcy P. Svisero

Supplementary Material B

TABELA B2 - Major element concentration of olivine from all samples. Structural formula calculated on the basis of 4 oxygens .

C - core; R - rim; I - intermediate; mega - megacrystals, macro - macrocrysts, micro - microcrysts.

Sample	TRIV-5-3	TRIV-5-3	TRIV-5-3	TRIV-5-3	TR-03	TR-03	TR-04A	TR-04A	TR-04A	TR-04A	TR-04B	TR-04B	TR-07	TR-07	TR-07
Grain/Analysis	31/61	31/62	32/63	32/64	01/01	01/02	02/03	02/04	03/05	03/06	04/07	04/08	05/09	05/10	06/11
Location	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C
Crystal type	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*	*mega*
SiO_2	40.87	40.86	40.75	40.15	40.64	39.05	40.48	40.13	40.44	39.56	40.77	40.92	40.69	40.02	39.91
Al_2O_3	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.01
FeO	8.91	8.75	9.77	9.88	8.94	9.12	7.62	7.74	8.33	8.26	8.47	8.26	8.22	8.29	8.64
MnO	0.10	0.09	0.09	0.11	0.14	0.16	0.11	0.11	0.09	0.03	0.09	0.16	0.11	0.07	0.10
NiO	0.40	0.38	0.42	0.39	0.02	0.02	0.00	0.01	0.00	0.01	0.03	0.00	0.00	0.05	0.00
CaO	0.02	0.01	0.02	0.04	0.01	0.03	0.01	0.02	0.01	0.01	0.00	0.00	0.01	0.03	0.02
K_2O	0.00	0.02	0.00	0.03	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.00
TiO_2	0.03	0.03	0.00	0.01	0.05	0.00	0.00	0.02	0.00	0.00	0.00	0.03	0.05	0.00	0.03
Cr_2O_3	0.02	0.00	0.00	0.01	0.32	0.30	0.39	0.38	0.34	0.38	0.37	0.37	0.38	0.39	0.36
MgO	49.92	49.95	49.39	50.13	50.54	49.94	50.64	51.87	50.36	50.10	50.94	50.92	50.66	50.89	50.23
Na_2O	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00
Total:	**100.28**	**100.11**	**100.44**	**100.76**	**100.66**	**98.63**	**99.28**	**100.29**	**99.57**	**98.36**	**100.70**	**100.68**	**100.13**	**99.74**	**99.31**
Si	0.996	0.997	0.996	0.981	0.972	0.991	0.975	0.990	0.982	0.988	0.990	0.990	0.980	0.982	0.987
Al	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.182	0.178	0.200	0.202	0.190	0.156	0.157	0.171	0.171	0.172	0.167	0.167	0.170	0.178	0.176
Mn	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.001	0.002	0.003	0.002	0.001	0.002	0.002
Ni	0.008	0.007	0.008	0.008	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.000
Ca	0.001	0.000	0.000	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001
K	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ti	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000
Cr	0.000	0.000	0.000	0.000	0.006	0.008	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.007	0.006
Mg	1.814	1.816	1.799	1.825	1.853	1.848	1.878	1.838	1.853	1.839	1.837	1.837	1.857	1.843	1.836
Na	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Cations:	**3.004**	**3.003**	**3.004**	**3.020**	**3.025**	**3.006**	**3.021**	**3.007**	**3.015**	**3.009**	**3.006**	**3.006**	**3.017**	**3.014**	**3.010**
Fayalite	0.09	0.09	0.10	0.10	0.09	0.08	0.08	0.08	0.08	0.09	0.08	0.08	0.08	0.09	0.09
Forsterite	0.91	0.91	0.90	0.90	0.91	0.92	0.92	0.92	0.92	0.91	0.92	0.92	0.92	0.91	0.91

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Bruna Coldebella, Rogério Guitarrari Azzone, Luanna Chmyz, Excelso Ruberti, Darcy P. Svisero

Supplementary Material B

TABELA B2 - Major element concentration of olivine from all samples. Structural formula calculated on the basis of 4 oxygens .

C - core; R - rim; I - intermediate; mega - megacrystals, macro - macrocrysts, micro - microcrysts.

Sample	TR-07	TR-07	TR-03	TR-03	TR-04A	TR-04A	TR-04A	TR-04A	TR-04B	TR-04B	TR-04B	TR-04B	TR-07	TR-07	TR-07	TR-07
Grain/Analysis	06/12	06/13	01/01	01/02	02/03	02/04	03/05	03/06	04/07	04/08	05/09	05/10	06/11	06/12	07/13	07/14
Location	I	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R
Crystal type	*mega*	*mega*	*macro*	*macro*	*macro*	*macro*	*macro*	*macro*	*macro*	*macro*	*macro*	*macro*	*macro*	*macro*	*macro*	*macro*
SiO_2	40.27	40.10	39.89	43.07	40.81	40.52	40.49	40.06	40.91	40.83	41.23	41.14	40.51	40.49	40.49	39.91
Al_2O_3	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00
FeO	8.60	8.35	7.95	7.76	8.44	8.45	8.46	8.37	7.77	8.01	7.61	7.45	7.72	7.79	8.58	8.90
MnO	0.12	0.13	0.06	0.11	0.11	0.09	0.11	0.10	0.10	0.12	0.07	0.12	0.11	0.09	0.07	0.10
NiO	0.01	0.00	0.00	0.00	0.02	0.03	0.04	0.00	0.00	0.03	0.00	0.05	0.03	0.00	0.04	0.00
CaO	0.03	0.06	0.00	0.04	0.00	0.02	0.01	0.06	0.01	0.03	0.01	0.02	0.01	0.02	0.01	0.03
K_2O	0.01	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.02	0.01	0.01	0.02	0.00	0.00
TiO_2	0.01	0.03	0.00	0.01	0.00	0.00	0.01	0.00	0.02	0.01	0.00	0.02	0.01	0.00	0.03	0.00
Cr_2O_3	0.33	0.40	0.36	0.45	0.38	0.39	0.37	0.40	0.36	0.35	0.35	0.38	0.40	0.41	0.40	0.37
MgO	50.24	49.97	51.56	48.21	50.95	51.04	50.74	51.03	51.37	50.56	52.00	51.50	51.10	49.74	49.95	50.30
Na_2O	0.00	0.03	0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.01	0.02	0.02	0.00	0.00	0.02	0.00
Total:	**99.62**	**99.07**	**99.82**	**99.71**	**100.70**	**100.56**	**100.24**	**100.02**	**100.56**	**99.95**	**101.32**	**100.71**	**99.90**	**98.56**	**99.59**	**99.61**
Si	0.988	0.974	1.042	0.988	0.984	0.986	0.978	0.989	0.994	0.988	0.992	0.987	0.998	0.992	0.981	0.966
Al	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.172	0.162	0.157	0.171	0.171	0.172	0.171	0.157	0.163	0.153	0.150	0.157	0.161	0.176	0.183	0.156
Mn	0.003	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.001	0.002	0.002	0.002	0.001	0.002	0.003
Ni	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.000	0.001	0.000	0.001
Ca	0.002	0.000	0.001	0.000	0.000	0.000	0.002	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.001	0.000
K	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000
Ti	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
Cr	0.008	0.007	0.009	0.007	0.007	0.007	0.008	0.007	0.007	0.007	0.007	0.008	0.008	0.008	0.007	0.007
Mg	1.835	1.877	1.739	1.839	1.847	1.841	1.857	1.851	1.834	1.858	1.851	1.855	1.828	1.824	1.842	1.897
Na	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.000	0.000
Cations:	**3.008**	**3.022**	**2.953**	**3.008**	**3.013**	**3.010**	**3.018**	**3.007**	**3.003**	**3.009**	**3.005**	**3.010**	**2.998**	**3.004**	**3.016**	**3.030**
Fayalite	0.09	0.08	0.08	0.09	0.08	0.09	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.08
Forsterite	0.91	0.92	0.92	0.91	0.92	0.91	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.91	0.91	0.92

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Supplementary Material B

TABELA B2 - Major element concentration of olivine from all samples. Structural formula calculated on the basis of 4 oxygens .

C - core; R - rim; I - intermediate; mega - megacrystals, macro - macrocrysts, micro - microcrysts.

Sample	TR-02	TR-04A	TR-04A	TR-04A	TR-04A	TR-04A	TR-04A	TR-04B	TR-04B	TR-04B	TR-04B	TR-07
Grain/Analysis	01/01	02/02	02/03	03/04	04/05	05/06	06/07	07/08	07/09	08/10	09/11	12/15
Location	C	C	R	C	C	C	C	C	R	C	C	C
Crystal type	*micro*	*micro*	*micro*	*micro*	*micro*	*micro*	*micro*	*micro*	*micro*	*micro*	*micro*	*micro*
SiO_2	39.52	40.71	40.96	40.52	40.13	40.48	40.38	40.68	41.08	40.83	40.18	40.13
Al_2O_3	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.01	0.02	0.01
FeO	7.65	7.81	9.68	7.66	8.38	9.43	8.72	8.56	10.28	7.85	12.29	10.55
MnO	0.12	0.10	0.17	0.10	0.13	0.14	0.09	0.13	0.16	0.09	0.15	0.16
NiO	0.04	0.00	0.03	0.07	0.00	0.02	0.00	0.01	0.01	0.00	0.09	0.01
CaO	0.01	0.01	0.04	0.00	0.03	0.03	0.01	0.01	0.05	0.01	0.12	0.08
K_2O	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.02	0.00
TiO_2	0.00	0.02	0.02	0.02	0.01	0.00	0.01	0.00	0.02	0.02	0.07	0.03
Cr_2O_3	0.35	0.37	0.35	0.37	0.34	0.41	0.39	0.39	0.37	0.45	0.36	0.30
MgO	52.06	50.75	49.14	51.12	50.30	49.36	49.87	50.30	48.58	51.65	46.68	48.51
Na_2O	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.02	0.00	0.04	0.00
Total:	**99.76**	**99.79**	**100.40**	**99.89**	**99.34**	**99.87**	**99.47**	**100.12**	**100.56**	**100.91**	**100.02**	**99.77**
Si	0.992	0.999	0.987	0.986	0.993	0.991	0.991	1.003	0.985	0.997	0.972	1.025
Al	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
Fe	0.159	0.197	0.156	0.172	0.193	0.179	0.174	0.210	0.158	0.255	0.174	0.208
Mn	0.002	0.004	0.002	0.003	0.003	0.002	0.003	0.003	0.002	0.003	0.002	0.003
Ni	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.001
Ca	0.000	0.001	0.000	0.001	0.001	0.000	0.000	0.001	0.000	0.003	0.001	0.001
K	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ti	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001
Cr	0.007	0.007	0.007	0.007	0.008	0.007	0.008	0.007	0.009	0.007	0.008	0.006
Mg	1.843	1.788	1.855	1.842	1.805	1.825	1.827	1.768	1.857	1.727	1.865	1.727
Na	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.000	0.002	0.000	0.000
Cations:	**3.004**	**2.997**	**3.009**	**3.011**	**3.003**	**3.005**	**3.005**	**2.994**	**3.011**	**2.999**	**3.023**	**2.972**
Fayalite	0.08	0.10	0.08	0.09	0.10	0.09	0.09	0.11	0.08	0.13	0.09	0.11
Forsterite	0.92	0.90	0.92	0.91	0.90	0.91	0.91	0.89	0.92	0.87	0.91	0.89

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OXYGEN FUGACITY OF THE ALTO PARANAÍBA KIMBERLITES AND DIAMOND INSTABILITY: TRÊS RANCHOS IV AND LIMEIRA I INTRUSIONS
Bruna Coldebella, Rogério Guitarrari Azzone, Luanna Chmyz, Excelso Ruberti, Darcy P. Svisero

Supplementary Material B

TABLE B3. *Major element concentration of monticellite from all samples. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate*

Sample	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2
Grain/Analysis	01/01	02/02	02/03	03/04	04/05	05/06	05/07	06/08	07/09	07/10	08/11	09/12	10/13	11/14	12/15	13/16	14/17	15/18	16/19	17/20
Location	C	C	R	C	C	C	R	C	C	R	C	C	C	C	C	C	C	C	C	C
SiO_2	36.63	36.44	37.02	36.13	36.36	35.76	36.41	35.85	36.63	36.92	36.50	37.40	38.19	37.93	37.59	37.22	36.67	37.66	37.15	36.18
Al_2O_3	0.01	0.03	0.01	0.02	0.02	0.00	0.01	0.01	0.01	0.03	0.02	0.07	0.02	0.06	0.11	0.04	0.11	0.03	0.09	0.00
FeO	8.86	8.72	6.29	10.82	9.21	11.71	9.36	10.83	8.77	6.49	8.97	3.01	3.74	3.15	2.95	3.88	2.97	4.44	3.27	12.37
MnO	0.38	0.38	0.23	0.22	0.40	0.25	0.36	0.22	0.33	0.32	0.39	0.54	0.35	0.48	0.27	0.26	0.32	0.41	0.25	0.72
NiO	0.00	0.03	0.02	0.03	0.03	0.03	0.01	0.04	0.03	0.03	0.02	0.04	0.04	0.04	0.04	0.06	0.02	0.04	0.06	0.01
CaO	32.55	32.71	34.68	33.75	32.27	33.76	32.66	33.92	32.58	33.74	32.66	34.84	34.79	34.39	34.54	34.31	34.65	34.44	34.55	32.93
K_2O	0.04	0.02	0.02	0.05	0.00	0.00	0.02	0.04	0.02	0.05	0.00	0.02	0.18	0.04	0.09	0.03	0.13	0.04	0.05	0.00
TiO_2	0.11	0.10	0.06	0.09	0.12	0.04	0.06	0.15	0.04	0.03	0.12	0.14	0.06	0.07	0.15	0.26	0.14	0.09	0.16	0.03
Cr_2O_3	0.00	0.01	0.00	0.04	0.04	0.00	0.03	0.04	0.02	0.00	0.00	0.00	0.04	0.01	0.03	0.03	0.04	0.05	0.06	0.05
MgO	20.90	21.14	21.45	18.48	20.90	17.87	20.98	18.23	21.36	21.39	21.20	24.18	23.15	23.69	24.94	23.70	24.36	23.51	24.50	17.82
Na_2O	0.08	0.09	0.05	0.16	0.12	0.12	0.09	0.10	0.06	0.03	0.08	0.02	0.06	0.04	0.06	0.02	0.05	0.03	0.08	0.04
Total:	99.55	99.66	99.85	99.78	99.47	99.54	99.99	99.42	99.85	99.04	99.96	100.26	100.61	99.92	100.78	99.81	99.46	100.74	100.21	100.16
Si	0.995	0.989	0.995	0.992	0.990	0.990	0.988	0.990	0.991	0.999	0.988	0.987	1.005	1.002	0.985	0.989	0.977	0.993	0.981	0.996
Al	0.000	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.001	0.002	0.004	0.001	0.004	0.001	0.003	0.000
Fe	0.201	0.198	0.141	0.249	0.210	0.271	0.212	0.250	0.198	0.147	0.203	0.066	0.082	0.070	0.065	0.086	0.066	0.098	0.072	0.285
Mn	0.009	0.009	0.005	0.005	0.009	0.006	0.008	0.005	0.007	0.007	0.009	0.012	0.008	0.011	0.006	0.006	0.007	0.009	0.006	0.017
Ni	0.000	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.000
Ca	0.947	0.951	0.999	0.993	0.941	1.001	0.949	1.003	0.945	0.979	0.947	0.985	0.981	0.973	0.970	0.976	0.989	0.973	0.978	0.971
K	0.001	0.001	0.001	0.002	0.000	0.000	0.001	0.001	0.001	0.002	0.000	0.001	0.006	0.001	0.003	0.001	0.004	0.001	0.002	0.000
Ti	0.002	0.002	0.001	0.002	0.002	0.001	0.001	0.003	0.001	0.001	0.003	0.003	0.001	0.001	0.003	0.005	0.003	0.002	0.003	0.001
Cr	0.000	0.000	0.000	0.001	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001
Mg	0.846	0.855	0.859	0.757	0.848	0.737	0.848	0.750	0.862	0.863	0.856	0.951	0.908	0.933	0.974	0.938	0.967	0.924	0.965	0.731
Na	0.004	0.005	0.003	0.009	0.006	0.006	0.005	0.005	0.003	0.002	0.004	0.001	0.003	0.002	0.003	0.001	0.003	0.001	0.004	0.002
Cations:	3.006	3.011	3.005	3.010	3.010	3.013	3.013	3.010	3.010	3.001	3.011	3.010	2.997	2.997	3.013	3.006	3.022	3.005	3.016	3.004
Mg#	80.78	81.20	85.87	75.27	80.17	73.11	79.97	74.99	81.27	85.45	80.81	93.47	91.69	93.06	93.77	91.58	93.60	90.42	93.03	71.96
XFe_{Liq}	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
XFe_{Mtc}	0.06	0.06	0.04	0.08	0.06	0.08	0.06	0.08	0.06	0.05	0.06	0.02	0.03	0.02	0.02	0.03	0.02	0.03	0.02	0.09
ΔNNO	-1.54	-1.42	0.03	-2.83	-1.74	-3.49	-1.81	-2.82	-1.45	-0.12	-1.57	2.41	1.73	2.24	2.47	1.66	2.47	1.24	2.19	-4.23

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Supplementary Material B

TABLE B3. *Major element concentration of monticellite from all samples. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate*

Sample	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1
Grain/Analysis	17/21	18/22	19/23	19/24	20/25	21/26	21/27	22/28	22/29	23/30	24/31	25/32	25/33	26/34	27/35	27/36	28/37	29/38
Location	R	C	C	R	C	C	R	C	R	C	C	C	R	C	C	R	C	R
SiO_2	37.20	37.96	36.63	37.30	36.78	36.52	37.94	36.97	37.33	37.81	36.98	36.25	37.19	35.16	37.01	36.57	37.40	37.14
Al_2O_3	0.00	0.12	0.03	0.06	0.10	0.02	0.03	0.01	0.03	0.01	0.02	0.02	0.03	0.12	0.01	0.03	0.03	0.06
FeO	6.08	5.19	9.75	3.75	7.45	9.88	5.35	9.49	6.85	3.95	9.77	10.09	4.49	7.85	9.59	6.72	7.53	3.24
MnO	0.90	0.45	0.66	0.26	0.49	0.61	0.36	0.61	0.46	0.23	0.73	0.60	0.31	0.57	0.38	0.38	0.56	0.35
NiO	0.03	0.04	0.01	0.00	0.04	0.04	0.01	0.02	0.04	0.06	0.00	0.02	0.04	0.04	0.03	0.02	0.03	0.04
CaO	34.48	32.82	33.03	35.05	32.92	32.10	33.59	32.60	33.39	34.75	32.10	33.03	34.82	33.87	33.00	34.11	33.93	34.87
K_2O	0.02	0.05	0.02	0.06	0.03	0.02	0.00	0.03	0.05	0.03	0.04	0.05	0.04	0.07	0.00	0.02	0.03	0.04
TiO_2	0.14	0.08	0.06	0.04	0.12	0.06	0.00	0.11	0.08	0.09	0.04	0.07	0.06	0.14	0.16	0.07	0.06	0.10
Cr_2O_3	0.00	0.00	0.04	0.04	0.00	0.06	0.02	0.03	0.00	0.01	0.00	0.01	0.00	0.05	0.03	0.02	0.00	0.00
MgO	21.66	22.17	19.90	23.87	22.15	20.46	23.05	20.59	21.84	23.92	20.13	20.38	23.20	20.73	20.42	22.59	21.53	24.47
Na_2O	0.03	0.03	0.06	0.05	0.03	0.05	0.03	0.04	0.05	0.01	0.04	0.04	0.00	0.04	0.10	0.08	0.02	0.05
Total:	100.53	98.90	100.20	100.49	100.11	99.83	100.38	100.50	100.13	100.88	99.84	100.55	100.19	98.63	100.72	100.62	101.12	100.35
Si	0.994	1.017	0.995	0.985	0.988	0.994	1.004	0.997	1.000	0.993	1.004	0.983	0.988	0.969	0.996	0.978	0.996	0.981
Al	0.000	0.004	0.001	0.002	0.003	0.001	0.001	0.000	0.001	0.000	0.001	0.001	0.001	0.004	0.000	0.001	0.001	0.002
Fe	0.136	0.116	0.221	0.083	0.167	0.225	0.118	0.214	0.153	0.087	0.222	0.229	0.100	0.181	0.216	0.150	0.168	0.072
Mn	0.020	0.010	0.015	0.006	0.011	0.014	0.008	0.014	0.010	0.005	0.017	0.014	0.007	0.013	0.009	0.009	0.013	0.008
Ni	0.001	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Ca	0.987	0.942	0.961	0.992	0.947	0.936	0.952	0.942	0.958	0.978	0.934	0.960	0.992	1.000	0.952	0.977	0.968	0.987
K	0.001	0.002	0.001	0.002	0.001	0.001	0.000	0.001	0.002	0.001	0.001	0.002	0.001	0.003	0.000	0.001	0.001	0.001
Ti	0.003	0.002	0.001	0.001	0.002	0.001	0.000	0.002	0.002	0.002	0.001	0.001	0.001	0.003	0.003	0.001	0.001	0.002
Cr	0.000	0.000	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000
Mg	0.862	0.886	0.806	0.940	0.887	0.830	0.909	0.828	0.872	0.937	0.815	0.824	0.919	0.852	0.820	0.900	0.855	0.963
Na	0.002	0.001	0.003	0.002	0.002	0.003	0.001	0.002	0.003	0.001	0.002	0.002	0.000	0.002	0.005	0.004	0.001	0.002
Cations:	3.005	2.981	3.005	3.015	3.010	3.006	2.996	3.002	3.001	3.006	2.996	3.017	3.010	3.028	3.003	3.022	3.003	3.018
Mg#	86.39	88.39	78.43	91.90	84.12	78.68	88.47	79.45	85.03	91.52	78.59	78.25	90.20	82.47	79.14	85.69	83.59	93.08
XFe_{Liq}	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
XFe_{Mtc}	0.04	0.04	0.07	0.03	0.05	0.07	0.04	0.07	0.05	0.03	0.07	0.07	0.03	0.05	0.07	0.05	0.05	0.02
ΔNNO	0.13	0.63	-2.12	1.79	-0.67	-2.20	0.59	-1.97	-0.35	1.61	-2.19	-2.27	1.22	-0.84	-2.02	-0.18	-0.74	2.22

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Supplementary Material B

TABLE B3. *Major element concentration of monticellite from all samples. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate*

Sample	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1
Grain/Analysis	30/39	31/40	32/42	33/43	34/44	35/45	36/46	37/47	37/48	38/49	38/50	39/51	40/52	41/53	42/54	42/55	42/56	43/57	44/58
Location	C	C	R	C	C	C	C	C	R	C	R	C	C	C	C	C	R	C	C
SiO_2	37.78	37.29	37.94	38.01	36.28	36.60	37.66	36.52	35.83	36.38	37.83	36.53	37.11	36.31	37.89	36.31	36.69	36.27	36.72
Al_2O_3	0.13	0.04	0.13	0.02	1.06	0.01	0.01	0.02	0.11	0.02	0.02	0.03	0.01	0.07	0.00	0.03	0.17	0.02	0.21
FeO	4.35	4.12	2.97	2.99	3.98	10.09	4.25	9.38	3.84	8.04	4.12	9.02	6.35	10.23	4.24	11.31	3.77	10.54	7.34
MnO	0.38	0.56	0.22	0.21	0.40	0.44	0.28	0.36	0.28	0.58	0.23	0.58	0.39	0.64	0.29	0.63	0.22	0.70	0.54
NiO	0.03	0.01	0.04	0.06	0.02	0.02	0.04	0.03	0.05	0.04	0.05	0.01	0.03	0.02	0.00	0.01	0.05	0.03	0.03
CaO	34.14	35.78	35.45	34.92	33.74	32.53	34.78	32.79	34.97	33.64	34.97	33.07	34.69	32.91	35.18	32.19	33.73	32.44	33.18
K_2O	0.13	0.13	0.14	0.08	0.05	0.01	0.16	0.04	0.10	0.08	0.02	0.00	0.04	0.04	0.08	0.03	0.14	0.02	0.02
TiO_2	0.10	0.07	0.13	0.07	0.38	0.06	0.01	0.09	1.65	0.67	0.09	0.10	0.02	0.07	0.01	0.04	0.22	0.10	0.07
Cr_2O_3	0.00	0.01	0.09	0.04	0.08	0.03	0.01	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.00	0.01	0.04	0.02	0.00
MgO	23.50	21.65	23.83	24.81	24.23	20.83	22.76	20.95	22.19	21.26	23.91	21.18	22.12	19.77	23.16	19.35	25.14	20.27	21.57
Na_2O	0.02	0.20	0.09	0.03	0.09	0.12	0.07	0.10	0.06	0.08	0.02	0.06	0.00	0.08	0.01	0.04	0.06	0.05	0.04
Total:	100.57	99.86	101.02	101.24	100.31	100.74	100.01	100.30	99.08	100.81	101.29	100.59	100.77	100.14	100.85	99.94	100.23	100.45	99.72
Si	0.997	0.997	0.993	0.991	0.960	0.988	1.001	0.988	0.965	0.977	0.991	0.985	0.989	0.989	0.998	0.994	0.971	0.986	0.991
Al	0.004	0.001	0.004	0.001	0.033	0.000	0.000	0.001	0.003	0.001	0.001	0.001	0.000	0.002	0.000	0.001	0.005	0.001	0.007
Fe	0.096	0.092	0.065	0.065	0.088	0.228	0.094	0.212	0.087	0.181	0.090	0.203	0.141	0.233	0.093	0.259	0.083	0.240	0.166
Mn	0.009	0.013	0.005	0.005	0.009	0.010	0.006	0.008	0.006	0.013	0.005	0.013	0.009	0.015	0.006	0.015	0.005	0.016	0.012
Ni	0.001	0.000	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.001	0.001	0.001
Ca	0.965	1.025	0.994	0.975	0.957	0.941	0.990	0.950	1.009	0.968	0.982	0.955	0.990	0.961	0.993	0.944	0.956	0.944	0.959
K	0.005	0.004	0.005	0.003	0.002	0.000	0.005	0.002	0.003	0.003	0.001	0.000	0.001	0.001	0.003	0.001	0.005	0.001	0.001
Ti	0.002	0.001	0.002	0.001	0.008	0.001	0.000	0.002	0.033	0.014	0.002	0.002	0.000	0.001	0.000	0.001	0.004	0.002	0.001
Cr	0.000	0.000	0.002	0.001	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
Mg	0.924	0.863	0.930	0.964	0.956	0.838	0.901	0.845	0.891	0.851	0.934	0.851	0.879	0.803	0.909	0.790	0.991	0.821	0.867
Na	0.001	0.010	0.005	0.002	0.005	0.006	0.003	0.005	0.003	0.004	0.001	0.003	0.000	0.004	0.001	0.002	0.003	0.003	0.002
Cations:	3.002	3.008	3.006	3.009	3.018	3.014	3.003	3.013	3.003	3.012	3.008	3.014	3.011	3.011	3.003	3.006	3.026	3.013	3.006
Mg#	90.59	90.35	93.46	93.66	91.56	78.62	90.51	79.92	91.15	82.49	91.18	80.71	86.12	77.49	90.68	75.30	92.24	77.41	83.96
XFe_{Liq}	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
XFe_{Mtc}	0.03	0.03	0.02	0.02	0.03	0.07	0.03	0.07	0.03	0.06	0.03	0.06	0.04	0.07	0.03	0.08	0.03	0.07	0.05
ΔNNO	1.28	1.45	2.42	2.43	1.59	-2.29	1.36	-1.83	1.67	-1.02	1.49	-1.59	0.01	-2.42	1.38	-3.24	1.79	-2.60	-0.62

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OXYGEN FUGACITY OF THE ALTO PARANAÍBA KIMBERLITES AND DIAMOND INSTABILITY: TRÊS RANCHOS IV AND LIMEIRA I INTRUSIONS
Bruna Coldebella, Rogério Guitarrari Azzone, Luanna Chmyz, Excelso Ruberti, Darcy P. Svisero

Supplementary Material B

TABLE B3. *Major element concentration of monticellite from all samples. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate*

Sample	LM3-1	LM3-1	LM3-1	LM3-1	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2
Grain/Analysis	45/59	46/60	46/61	48/64	49/65	50/66	51/67	52/68	53/69	54/70	54/71	57/74	58/76	58/77	59/78	60/79	61/80	61/81	62/82
Location	C	C	R	C	C	C	C	C	C	C	R	C	C	R	C	C	C	R	C
SiO_2	36.62	36.29	37.68	35.19	36.54	37.25	37.41	37.49	37.79	37.58	36.86	37.30	36.83	36.52	37.20	36.61	36.87	37.52	37.79
Al_2O_3	0.03	0.02	0.06	1.69	0.01	0.01	0.01	0.01	0.04	0.02	0.01	0.02	0.01	0.07	0.03	0.01	0.04	0.12	0.07
FeO	7.58	9.91	5.08	5.24	7.76	5.46	3.91	4.00	3.66	5.91	7.68	7.53	8.89	6.99	5.73	9.40	8.99	3.23	3.04
MnO	0.49	0.71	0.39	0.21	0.52	0.39	0.29	0.31	0.58	0.42	0.50	0.49	0.51	0.42	0.40	0.36	0.61	0.21	0.35
NiO	0.01	0.00	0.05	0.03	0.02	0.03	0.01	0.03	0.05	0.01	0.01	0.05	0.02	0.03	0.03	0.03	0.00	0.01	0.03
CaO	33.61	32.64	34.15	31.60	33.12	33.66	33.62	34.47	33.50	33.06	32.17	32.54	31.97	32.63	32.82	31.72	31.89	33.91	33.31
K_2O	0.05	0.00	0.01	1.42	0.07	0.03	0.06	0.04	0.03	0.04	0.01	0.02	0.02	0.05	0.05	0.01	0.02	0.16	0.03
TiO_2	0.08	0.10	0.15	0.61	0.06	0.03	0.00	0.00	0.17	0.06	0.08	0.07	0.13	0.22	0.03	0.07	0.04	0.11	0.21
Cr_2O_3	0.03	0.00	0.04	0.16	0.01	0.00	0.00	0.03	0.06	0.00	0.06	0.02	0.04	0.01	0.04	0.00	0.00	0.00	0.07
MgO	22.08	20.07	23.10	23.76	21.54	22.58	23.69	23.49	23.91	22.54	21.74	21.62	21.07	22.14	22.54	20.98	21.24	24.45	24.34
Na_2O	0.05	0.06	0.04	0.10	0.04	0.03	0.01	0.00	0.05	0.03	0.06	0.06	0.07	0.04	0.05	0.09	0.03	0.08	0.04
Total:	100.62	99.80	100.76	100.03	99.69	99.48	99.01	99.87	99.83	99.68	99.18	99.71	99.56	99.10	98.90	99.26	99.73	99.81	99.27
Si	0.982	0.990	0.995	0.943	0.989	0.998	0.999	0.995	1.000	1.004	0.998	1.004	0.998	0.989	1.002	0.997	0.998	0.992	1.001
Al	0.001	0.001	0.002	0.053	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.001	0.000	0.002	0.001	0.000	0.001	0.004	0.002
Fe	0.170	0.226	0.112	0.117	0.176	0.122	0.087	0.089	0.081	0.132	0.174	0.169	0.202	0.158	0.129	0.214	0.203	0.071	0.067
Mn	0.011	0.016	0.009	0.005	0.012	0.009	0.006	0.007	0.013	0.009	0.011	0.011	0.012	0.010	0.009	0.008	0.014	0.005	0.008
Ni	0.000	0.000	0.001	0.001	0.000	0.001	0.000	0.001	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.000	0.000	0.001
Ca	0.965	0.954	0.966	0.907	0.960	0.966	0.962	0.981	0.950	0.947	0.933	0.938	0.929	0.946	0.947	0.925	0.925	0.961	0.945
K	0.002	0.000	0.000	0.049	0.002	0.001	0.002	0.001	0.001	0.001	0.000	0.001	0.001	0.002	0.002	0.000	0.001	0.005	0.001
Ti	0.002	0.002	0.003	0.012	0.001	0.001	0.000	0.000	0.003	0.001	0.002	0.001	0.003	0.004	0.001	0.001	0.001	0.002	0.004
Cr	0.001	0.000	0.001	0.003	0.000	0.000	0.000	0.001	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.001
Mg	0.882	0.816	0.910	0.949	0.869	0.902	0.943	0.930	0.943	0.898	0.878	0.867	0.851	0.894	0.905	0.852	0.857	0.964	0.961
Na	0.003	0.003	0.002	0.005	0.002	0.002	0.001	0.000	0.003	0.002	0.003	0.003	0.004	0.002	0.003	0.005	0.002	0.004	0.002
Cations:	3.018	3.009	3.002	3.044	3.012	3.002	3.002	3.005	2.997	2.996	3.001	2.996	3.001	3.007	2.999	3.004	3.002	3.008	2.994
Mg#	83.84	78.30	89.01	88.99	83.18	88.05	91.52	91.28	92.09	87.17	83.45	83.65	80.85	84.95	87.51	79.91	80.80	93.10	93.45
XFe_{Liq}	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
XFe_{Mtc}	0.05	0.07	0.04	0.04	0.05	0.04	0.03	0.03	0.03	0.04	0.05	0.05	0.06	0.05	0.04	0.07	0.06	0.02	0.02
ΔNNO	-0.71	-2.20	0.78	0.65	-0.85	0.53	1.63	1.57	1.80	0.22	-0.84	-0.78	-1.59	-0.40	0.34	-1.89	-1.64	2.20	2.34

Supplementary Material B

TABLE B3. *Major element concentration of monticellite from all samples. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate*

Sample	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2
Grain/Analysis	63/83	63/84	64/85	65/86	65/87	66/88	67/89	68/90
Location	C	R	C	C	R	C	C	C
SiO_2	37.25	37.86	36.35	37.16	36.91	36.94	37.08	37.10
Al_2O_3	0.01	0.01	0.07	0.01	0.00	0.07	0.02	0.05
FeO	6.85	4.17	6.55	9.68	6.99	3.67	5.98	6.39
MnO	0.48	0.32	0.45	0.62	0.49	0.24	0.43	0.45
NiO	0.04	0.03	0.05	0.01	0.04	0.02	0.03	0.05
CaO	32.70	34.53	31.35	31.82	32.47	33.52	33.31	32.77
K_2O	0.03	0.01	0.02	0.06	0.03	0.05	0.01	0.02
TiO_2	0.03	0.01	0.07	0.02	0.07	0.21	0.05	0.14
Cr_2O_3	0.00	0.00	0.07	0.00	0.01	0.02	0.03	0.01
MgO	22.40	23.69	23.94	20.44	22.60	24.38	22.43	22.72
Na_2O	0.02	0.00	0.03	0.07	0.04	0.08	0.03	0.04
Total:	99.81	100.63	98.95	99.89	99.64	99.20	99.40	99.76
Si	0.999	0.997	0.981	1.007	0.992	0.985	0.996	0.994
Al	0.000	0.000	0.002	0.000	0.000	0.002	0.000	0.001
Fe	0.154	0.092	0.148	0.219	0.157	0.082	0.134	0.143
Mn	0.011	0.007	0.010	0.014	0.011	0.005	0.010	0.010
Ni	0.001	0.001	0.001	0.000	0.001	0.000	0.001	0.001
Ca	0.939	0.975	0.906	0.923	0.935	0.958	0.959	0.941
K	0.001	0.000	0.001	0.002	0.001	0.002	0.000	0.001
Ti	0.001	0.000	0.001	0.000	0.001	0.004	0.001	0.003
Cr	0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.000
Mg	0.895	0.930	0.963	0.825	0.906	0.969	0.899	0.907
Na	0.001	0.000	0.001	0.004	0.002	0.004	0.001	0.002
Cations:	3.002	3.003	3.017	2.996	3.008	3.013	3.003	3.004
Mg#	85.35	91.01	86.69	79.00	85.21	92.21	86.98	86.37
XFe_{Liq}	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
XFe_{Mtc}	0.05	0.03	0.05	0.07	0.05	0.03	0.04	0.04
ΔNNO	-0.34	1.44	-0.10	-2.14	-0.40	1.84	0.21	-0.05

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Supplementary Material B

Table B4. *Major element compostions of perovskite from TR-IV LM-I. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate.*

Sample	TR-4	TR-02	TR-02	TR-4	TR-02	TR-4	TR-02	TR-4	TR-02	TR-4	TR-02	TR-4	TR-02
Grain/ Analysis	01/01	01/01	01/02	01/02	01/03	02/03	02/04	02/04	02/05	03/05	03/06	03/06	03/07
Location	C	C	I	R	R	C	C	R	R	C	C	R	R
SiO_2	0.00	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fe_2O_3	1.21	1.45	1.50	1.21	1.67	1.72	1.34	1.94	1.49	1.47	1.03	1.49	1.25
La_2O_3	2.77	3.55	3.07	2.37	2.58	3.27	3.29	3.07	2.56	3.22	1.97	3.30	0.99
Sm_2O_3	0.20	0.31	0.28	0.17	0.24	0.21	0.30	0.20	0.22	0.20	0.19	0.21	0.10
Pr_2O_3	0.65	0.80	0.61	0.50	0.48	0.77	0.77	0.69	0.42	0.76	0.40	0.75	0.13
CaO	30.11	25.14	29.61	32.62	32.12	28.06	28.06	29.21	32.12	27.35	33.93	27.50	37.95
Nb_2O_5	0.99	2.36	1.70	0.92	1.67	1.57	1.86	1.18	1.50	2.73	0.78	2.62	1.00
SrO	0.74	0.78	0.74	0.74	0.79	0.73	0.76	0.75	0.78	0.78	0.62	0.80	0.67
ZrO_2	0.07	0.25	0.23	0.09	0.24	0.17	0.18	0.10	0.16	0.24	0.09	0.22	0.14
ThO_2	0.67	2.45	0.38	0.21	0.04	1.32	1.12	0.65	0.09	1.19	0.25	1.27	0.00
TiO_2	50.80	48.03	50.53	52.37	51.30	49.15	49.60	49.33	51.25	48.17	53.15	48.42	55.01
BaO	0.00	0.10	0.11	0.00	0.11	0.00	0.10	0.00	0.11	0.00	0.15	0.00	0.13
Ce_2O_3	6.68	8.85	7.00	5.35	5.19	7.81	7.85	6.95	5.27	7.65	4.50	7.88	1.40
Nd_2O_3	2.16	2.77	2.17	1.72	1.58	2.47	2.44	2.21	1.60	2.40	1.49	2.45	0.39
Na_2O	1.83	3.05	2.17	1.49	1.57	2.09	2.38	1.79	1.56	2.39	1.26	2.42	0.65
MgO	0.00	0.08	0.06	0.00	0.07	0.00	0.05	0.00	0.06	0.00	0.03	0.00	0.04
Al_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Ta_2O_5	0.00	0.45	0.11	0.00	0.04	0.00	0.22	0.00	0.02	0.00	0.11	0.00	0.01
Total	**98.89**	**100.43**	**100.27**	**99.76**	**99.70**	**99.35**	**100.30**	**98.07**	**99.23**	**98.55**	**99.94**	**99.33**	**99.83**
Si	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.023	0.028	0.031	0.022	0.025	0.033	0.027	0.037	0.019	0.028	0.022	0.028	0.024
La	0.025	0.028	0.023	0.021	0.030	0.030	0.023	0.029	0.017	0.030	0.008	0.031	0.031
Sm	0.002	0.002	0.002	0.001	0.003	0.002	0.002	0.002	0.002	0.002	0.001	0.002	0.002
Pr	0.006	0.006	0.004	0.004	0.007	0.007	0.004	0.006	0.004	0.007	0.001	0.007	0.006
Ca	0.803	0.782	0.837	0.847	0.752	0.759	0.841	0.790	0.872	0.746	0.946	0.746	0.733
Nb	0.011	0.019	0.018	0.010	0.021	0.018	0.017	0.013	0.008	0.031	0.011	0.030	0.032
Sr	0.011	0.011	0.011	0.010	0.011	0.011	0.011	0.011	0.009	0.011	0.009	0.012	0.011
Zr	0.001	0.003	0.003	0.001	0.002	0.002	0.002	0.001	0.001	0.003	0.002	0.003	0.003
Th	0.004	0.002	0.000	0.001	0.006	0.008	0.001	0.004	0.001	0.007	0.000	0.007	0.007
Ti	0.951	0.937	0.939	0.955	0.933	0.933	0.942	0.937	0.960	0.922	0.963	0.922	0.921
Ba	0.000	0.001	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001
Ce	0.061	0.063	0.046	0.047	0.072	0.072	0.047	0.064	0.040	0.071	0.012	0.073	0.074
Nd	0.019	0.019	0.014	0.015	0.022	0.022	0.014	0.020	0.013	0.022	0.003	0.022	0.021
Na	0.088	0.104	0.074	0.070	0.115	0.102	0.074	0.088	0.058	0.118	0.029	0.119	0.129
Mg	0.000	0.002	0.003	0.000	0.002	0.000	0.002	0.000	0.001	0.000	0.001	0.000	0.002
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ta	0.000	0.001	0.000	0.000	0.002	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.002
Cations	**2.004**	**2.007**	**2.007**	**2.007**	**2.003**	**1.998**	**2.009**	**2.003**	**2.007**	**1.999**	**2.010**	**2.001**	**2.001**
lueshite	0.01	0.03	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.03	0.01	0.03	0.01
loparite	0.16	0.25	0.17	0.12	0.11	0.17	0.19	0.15	0.12	0.18	0.10	0.18	0.04
$REEFeO_3$	0.02	0.03	0.03	0.02	0.03	0.03	0.03	0.04	0.03	0.03	0.02	0.03	0.01
tausonite	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
$REE_2Ti_2O_7$	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.01	0.00
lakargiite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
perovskite	0.79	0.68	0.76	0.83	0.82	0.75	0.74	0.78	0.82	0.74	0.86	0.73	0.93
Fe/Nb	**2.04**	**1.47**	**1.67**	**2.20**	**1.20**	**1.82**	**1.66**	**2.74**	**2.20**	**0.90**	**2.07**	**0.95**	**0.74**
ΔNNO	**-3.21**	**-2.91**	**-2.14**	**-3.22**	**-3.83**	**-1.57**	**-2.71**	**0.03**	**-3.91**	**-4.39**	**-3.36**	**-4.15**	**-5.60**

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Supplementary Material B

Table B4. *Major element compostions of perovskite from TR-IV LM-I. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate.*

Sample	TR-4	TR-02	TR-4	TR-02	TR-4	TR-07	TR-4	TR-07	TR-4	TR-07	TR-4	TR-07	TR-4
Grain/ Analysis	04/07	04/08	04/08	04/09	05/09	05/10	05/10	05/11	06/11	06/12	06/12	06/13	07/13
Location	C	C	R	R	C	C	R	R	C	C	R	R	C
SiO_2	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.41	0.00	0.00	0.00	0.09	0.00
Fe_2O_3	1.67	1.26	1.59	1.59	1.33	1.19	1.38	1.39	1.60	1.07	1.62	1.21	1.34
La_2O_3	3.24	3.36	3.60	2.70	3.35	3.29	3.58	2.76	3.29	2.28	3.26	2.08	3.11
Sm_2O_3	0.21	0.27	0.23	0.21	0.22	0.26	0.23	0.24	0.22	0.21	0.22	0.18	0.22
Pr_2O_3	0.66	0.68	0.79	0.42	0.78	0.66	0.81	0.46	0.77	0.45	0.77	0.37	0.70
CaO	29.14	27.21	26.86	31.96	27.73	28.52	27.78	30.64	28.16	32.78	27.76	33.66	29.19
Nb_2O_5	1.76	2.85	1.90	1.94	1.62	2.16	1.69	1.93	1.50	0.96	1.67	0.97	1.72
SrO	0.77	0.78	0.78	0.85	0.77	0.78	0.86	0.79	0.78	0.68	0.75	0.65	0.77
ZrO_2	0.23	0.28	0.22	0.24	0.13	0.18	0.14	0.20	0.15	0.08	0.16	0.09	0.15
ThO_2	0.17	1.17	0.71	0.09	0.80	0.60	0.78	0.09	1.33	0.27	1.49	0.09	0.49
TiO_2	49.63	48.73	48.78	50.77	49.91	49.79	50.11	49.65	49.20	51.33	48.66	53.22	49.88
BaO	0.00	0.12	0.00	0.11	0.00	0.12	0.00	0.08	0.00	0.09	0.00	0.14	0.00
Ce_2O_3	6.84	8.07	8.20	5.49	7.99	7.55	8.24	5.78	7.81	5.20	7.90	4.36	7.09
Nd_2O_3	2.12	2.39	2.54	1.67	2.56	2.34	2.61	1.80	2.50	1.74	2.53	1.37	2.27
Na_2O	2.15	2.64	2.52	1.47	2.31	2.40	2.29	1.85	2.11	1.54	2.13	1.35	1.94
MgO	0.00	0.05	0.00	0.08	0.00	0.04	0.00	0.50	0.00	0.03	0.00	0.16	0.00
Al_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00
Ta_2O_5	0.00	0.33	0.00	0.06	0.00	0.15	0.00	0.07	0.00	0.13	0.00	0.06	0.00
Total	**98.60**	**100.19**	**98.72**	**99.65**	**99.50**	**100.03**	**100.49**	**98.64**	**99.43**	**98.84**	**98.92**	**100.05**	**98.86**
Si	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.002	0.000	0.000	0.000
Fe	0.031	0.029	0.030	0.022	0.025	0.026	0.026	0.020	0.030	0.022	0.031	0.029	0.025
La	0.030	0.024	0.034	0.030	0.031	0.025	0.033	0.021	0.031	0.018	0.031	0.016	0.029
Sm	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.002
Pr	0.006	0.004	0.007	0.006	0.007	0.004	0.007	0.004	0.007	0.003	0.007	0.002	0.006
Ca	0.782	0.837	0.732	0.761	0.746	0.811	0.742	0.861	0.761	0.862	0.756	0.889	0.783
Nb	0.020	0.021	0.022	0.024	0.018	0.021	0.019	0.011	0.017	0.010	0.019	0.010	0.019
Sr	0.011	0.012	0.012	0.011	0.011	0.011	0.012	0.010	0.011	0.009	0.011	0.009	0.011
Zr	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.001	0.002	0.001	0.002	0.001	0.002
Th	0.001	0.001	0.004	0.003	0.005	0.001	0.004	0.001	0.008	0.000	0.009	0.000	0.003
Ti	0.935	0.933	0.933	0.933	0.943	0.923	0.940	0.947	0.934	0.957	0.930	0.955	0.940
Ba	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000
Ce	0.063	0.049	0.076	0.069	0.073	0.052	0.075	0.047	0.072	0.038	0.074	0.032	0.065
Nd	0.019	0.015	0.023	0.021	0.023	0.016	0.023	0.015	0.023	0.012	0.023	0.010	0.020
Na	0.104	0.070	0.124	0.116	0.112	0.088	0.111	0.073	0.103	0.063	0.105	0.052	0.094
Mg	0.000	0.003	0.000	0.001	0.000	0.018	0.000	0.001	0.000	0.006	0.000	0.002	0.000
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ta	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Cations	**2.008**	**2.004**	**2.003**	**2.006**	**1.999**	**2.013**	**1.997**	**2.016**	**2.001**	**2.007**	**1.999**	**2.009**	**2.000**
lueshite	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.01	0.02
loparite	0.17	0.20	0.21	0.10	0.19	0.19	0.19	0.14	0.18	0.13	0.18	0.11	0.15
$REEFeO_3$	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.02	0.03
tausonite	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
$REE_2Ti_2O_7$	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.01
lakargiite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
perovskite	0.76	0.72	0.72	0.82	0.74	0.74	0.74	0.79	0.75	0.83	0.75	0.85	0.78
Fe/Nb	**1.58**	**1.37**	**1.39**	**0.91**	**1.36**	**1.20**	**1.36**	**1.85**	**1.78**	**2.08**	**1.61**	**2.94**	**1.29**
ΔNNO	**-2.12**	**-2.87**	**-2.62**	**-4.98**	**-3.54**	**-3.73**	**-3.43**	**-3.89**	**-2.05**	**-3.38**	**-2.15**	**-1.58**	**-3.64**

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Supplementary Material B

Table B4. *Major element compostions of perovskite from TR-IV LM-I. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate.*

Sample	TR-07	TR-4	TR-4	TR-18	TR-4	TR-18	TR-03	TR-4	TR-03	TR-4	TR-03	TR-4	TR-03
Grain/ Analysis	07/14	07/14	08/15	08/16	08/16	08/17	09/18	09/18	09/19	10/19	10/20	10/20	10/21
Location	C	R	C	C	R	R	C	R	R	C	C	R	I
SiO_2	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.05	0.00	0.00	0.00	0.00
Fe_2O_3	1.58	1.35	1.19	1.58	1.23	1.71	1.43	1.47	1.67	1.37	1.27	1.29	1.25
La_2O_3	1.80	3.01	2.76	3.27	2.19	3.11	3.26	3.40	2.34	1.30	3.12	1.01	2.69
Sm_2O_3	0.15	0.21	0.18	0.28	0.16	0.28	0.28	0.22	0.21	0.11	0.27	0.09	0.24
Pr_2O_3	0.27	0.66	0.67	0.76	0.42	0.53	0.71	0.74	0.42	0.34	0.74	0.18	0.60
CaO	34.64	29.99	30.41	26.47	33.78	29.48	28.31	28.36	32.52	35.67	28.64	36.86	31.12
Nb_2O_5	0.90	1.69	0.96	4.35	1.01	2.30	1.80	1.84	1.34	0.54	1.38	0.50	1.09
SrO	0.67	0.76	0.70	0.81	0.71	0.84	0.76	0.76	0.73	0.52	0.73	0.53	0.72
ZrO_2	0.08	0.14	0.04	0.61	0.09	0.31	0.24	0.18	0.21	0.04	0.13	0.06	0.11
ThO_2	0.07	0.30	0.78	1.70	0.08	0.24	1.30	0.56	0.07	0.21	1.17	0.05	0.37
TiO_2	53.04	50.28	51.07	46.71	52.95	49.24	49.31	49.54	51.33	53.46	50.17	55.15	51.54
BaO	0.12	0.00	0.00	0.14	0.00	0.09	0.11	0.00	0.08	0.00	0.13	0.00	0.08
Ce_2O_3	3.69	6.79	6.53	7.99	4.59	6.61	7.70	7.64	4.76	3.00	7.62	1.96	6.18
Nd_2O_3	1.14	2.16	2.15	2.34	1.46	1.98	2.47	2.39	1.46	1.05	2.44	0.66	1.97
Na_2O	1.12	1.80	1.73	2.78	1.16	1.88	2.29	2.19	1.62	0.87	2.21	0.73	1.86
MgO	0.05	0.00	0.00	0.06	0.00	0.74	0.08	0.00	0.16	0.00	0.05	0.00	0.05
Al_2O_3	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Ta_2O_5	0.04	0.00	0.00	0.60	0.00	0.01	0.31	0.00	0.08	0.00	0.22	0.00	0.09
Total	**99.34**	**99.14**	**99.18**	**100.46**	**99.84**	**99.96**	**100.34**	**99.30**	**99.04**	**98.47**	**100.28**	**99.05**	**99.96**
Si	0.000	0.000	0.000	0.015	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.011
Fe	0.021	0.025	0.022	0.032	0.022	0.027	0.031	0.028	0.024	0.025	0.023	0.023	0.030
La	0.013	0.028	0.025	0.028	0.019	0.030	0.021	0.031	0.029	0.011	0.024	0.009	0.018
Sm	0.001	0.002	0.002	0.002	0.001	0.002	0.002	0.002	0.002	0.001	0.002	0.001	0.001
Pr	0.002	0.006	0.006	0.005	0.004	0.007	0.004	0.007	0.007	0.003	0.005	0.002	0.003
Ca	0.915	0.799	0.807	0.776	0.869	0.759	0.849	0.763	0.765	0.915	0.816	0.928	0.861
Nb	0.011	0.019	0.011	0.026	0.011	0.020	0.015	0.021	0.015	0.006	0.012	0.005	0.014
Sr	0.010	0.011	0.010	0.012	0.010	0.011	0.010	0.011	0.010	0.007	0.010	0.007	0.011
Zr	0.002	0.002	0.001	0.004	0.001	0.003	0.003	0.002	0.002	0.000	0.001	0.001	0.002
Th	0.000	0.002	0.004	0.001	0.000	0.007	0.000	0.003	0.007	0.001	0.002	0.000	0.000
Ti	0.960	0.940	0.952	0.910	0.957	0.928	0.941	0.935	0.940	0.963	0.949	0.975	0.935
Ba	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.000	0.001	0.000	0.001	0.000	0.001
Ce	0.023	0.062	0.059	0.059	0.040	0.070	0.042	0.070	0.070	0.026	0.055	0.017	0.034
Nd	0.007	0.019	0.019	0.017	0.013	0.022	0.013	0.021	0.022	0.009	0.017	0.006	0.010
Na	0.038	0.087	0.083	0.090	0.054	0.111	0.077	0.107	0.107	0.040	0.088	0.033	0.055
Mg	0.001	0.000	0.000	0.027	0.000	0.003	0.006	0.000	0.002	0.000	0.002	0.000	0.024
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ta	0.000	0.000	0.000	0.000	0.000	0.002	0.001	0.000	0.001	0.000	0.001	0.000	0.000
Cations	**2.006**	**2.001**	**2.002**	**2.005**	**2.002**	**2.004**	**2.014**	**2.001**	**2.003**	**2.009**	**2.009**	**2.005**	**2.010**
lueshite	0.01	0.02	0.01	0.05	0.01	0.03	0.02	0.02	0.02	0.01	0.02	0.01	0.01
loparite	0.09	0.14	0.15	0.18	0.09	0.13	0.19	0.18	0.13	0.07	0.19	0.06	0.16
$REEFeO_3$	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.02
tausonite	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
$REE_2Ti_2O_7$	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.00
lakargiite	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
perovskite	0.87	0.79	0.80	0.71	0.86	0.78	0.74	0.75	0.82	0.90	0.75	0.92	0.79
Fe/Nb	**1.89**	**1.33**	**2.08**	**1.23**	**2.03**	**1.33**	**2.08**	**1.33**	**1.54**	**4.24**	**1.90**	**4.28**	**2.09**
ΔNNO	**-3.56**	**-3.58**	**-3.27**	**-2.80**	**-3.30**	**-3.29**	**-1.69**	**-3.17**	**-3.48**	**-2.06**	**-3.25**	**-2.45**	**-1.87**

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Supplementary Material B

Table B4. *Major element compostions of perovskite from TR-IV LM-I. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate.*

Sample	TR-03	TR4-1	TR4-1	TR-03	TR-03	TR4-1	TR4-1	TR-03	TR-03	TR4-1	TR4-1	TR4-1	TR-03
Grain/ Analysis	10/22	11/21	11/22	11/23	11/24	12/23	12/24	12/25	12/26	13/25	13/25	13/26	13/27
Location	R	C	R	C	R	C	R	C	R	C	C	R	C
SiO_2	0.45	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
Fe_2O_3	1.66	1.75	1.68	1.49	1.94	1.76	1.73	1.96	1.65	1.39	1.39	1.48	1.75
La_2O_3	2.09	2.83	3.20	2.69	2.33	3.43	3.60	2.84	2.91	3.26	3.26	3.31	3.02
Sm_2O_3	0.17	0.19	0.20	0.23	0.21	0.22	0.23	0.26	0.25	0.22	0.22	0.23	0.26
Pr_2O_3	0.34	0.64	0.67	0.50	0.33	0.83	0.83	0.58	0.56	0.82	0.82	0.82	0.59
CaO	33.90	29.76	29.59	32.03	33.46	26.12	27.02	30.61	30.56	26.42	26.42	27.06	30.66
Nb_2O_5	1.32	2.38	1.72	1.29	1.54	2.75	2.25	1.45	1.67	1.58	1.58	2.05	1.97
SrO	0.80	0.82	0.82	0.76	0.81	0.82	0.78	0.77	0.82	0.72	0.72	0.73	0.82
ZrO_2	0.21	0.27	0.16	0.15	0.24	0.35	0.28	0.18	0.19	0.14	0.14	0.20	0.32
ThO_2	0.03	0.28	0.15	0.20	0.04	2.21	1.34	0.40	0.64	2.60	2.60	2.11	0.15
TiO_2	52.44	49.57	50.19	51.66	51.72	47.58	48.19	50.80	50.61	48.88	48.88	48.94	50.55
BaO	0.10	0.00	0.00	0.11	0.13	0.00	0.00	0.12	0.12	0.00	0.00	0.00	0.11
Ce_2O_3	3.88	6.42	6.96	5.74	4.22	8.45	8.40	6.42	6.39	8.38	8.38	8.40	6.33
Nd_2O_3	1.13	2.02	2.17	1.76	1.33	2.65	2.59	1.95	2.01	2.76	2.76	2.70	1.95
Na_2O	1.19	2.00	2.01	1.74	1.29	2.54	2.44	1.80	1.80	2.64	2.64	2.52	1.79
MgO	0.68	0.00	0.00	0.04	0.11	0.00	0.00	0.14	0.06	0.00	0.00	0.00	0.14
Al_2O_3	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01
Ta_2O_5	0.03	0.00	0.00	0.09	0.04	0.00	0.00	0.12	0.15	0.00	0.00	0.00	0.06
Total	**100.40**	**98.92**	**99.51**	**100.47**	**99.90**	**99.72**	**99.68**	**100.40**	**100.39**	**99.80**	**99.80**	**100.53**	**100.54**
Si	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.003
Fe	0.027	0.033	0.031	0.035	0.036	0.034	0.033	0.030	0.032	0.027	0.027	0.028	0.040
La	0.024	0.026	0.029	0.021	0.026	0.032	0.034	0.026	0.027	0.031	0.031	0.031	0.025
Sm	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Pr	0.004	0.006	0.006	0.003	0.005	0.008	0.008	0.005	0.005	0.008	0.008	0.008	0.004
Ca	0.832	0.793	0.787	0.862	0.803	0.715	0.735	0.804	0.803	0.720	0.720	0.730	0.827
Nb	0.014	0.027	0.019	0.017	0.016	0.032	0.026	0.019	0.022	0.018	0.018	0.023	0.024
Sr	0.011	0.012	0.012	0.011	0.011	0.012	0.011	0.012	0.012	0.011	0.011	0.011	0.012
Zr	0.002	0.003	0.002	0.003	0.002	0.004	0.003	0.002	0.004	0.002	0.002	0.002	0.006
Th	0.001	0.002	0.001	0.000	0.002	0.013	0.008	0.004	0.001	0.015	0.015	0.012	0.000
Ti	0.943	0.928	0.937	0.936	0.935	0.914	0.920	0.935	0.929	0.935	0.935	0.927	0.919
Ba	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.001
Ce	0.051	0.058	0.063	0.037	0.058	0.079	0.078	0.057	0.057	0.078	0.078	0.077	0.047
Nd	0.015	0.018	0.019	0.011	0.017	0.024	0.023	0.018	0.017	0.025	0.025	0.024	0.014
Na	0.082	0.096	0.097	0.060	0.086	0.126	0.120	0.086	0.085	0.130	0.130	0.123	0.072
Mg	0.002	0.000	0.000	0.004	0.005	0.000	0.000	0.002	0.005	0.000	0.000	0.000	0.009
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ta	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Cations	**2.011**	**2.004**	**2.005**	**2.008**	**2.006**	**1.995**	**2.001**	**2.004**	**2.004**	**2.001**	**2.001**	**2.000**	**2.006**
lueshite	0.01	0.03	0.02	0.01	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.02
loparite	0.08	0.14	0.16	0.14	0.09	0.19	0.19	0.14	0.14	0.23	0.20	0.19	0.13
$REEFeO_3$	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03
tausonite	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
$REE_2Ti_2O_7$	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.01
lakargiite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
perovskite	0.86	0.78	0.77	0.81	0.85	0.71	0.72	0.79	0.79	0.71	0.72	0.74	0.79
Fe/Nb	**1.93**	**1.22**	**1.63**	**2.10**	**2.25**	**1.07**	**1.28**	**1.64**	**1.47**	**1.46**	**1.46**	**1.20**	**1.66**
ΔNNO	**-2.46**	**-2.65**	**-2.07**	**-0.82**	**-0.47**	**-3.01**	**-2.47**	**-2.21**	**-2.19**	**-3.12**	**-3.12**	**-3.40**	**-0.58**

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Supplementary Material B

Table B4. *Major element compostions of perovskite from TR-IV LM-I. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate.*

Sample	TR4-1	TR4-1	TR-04a	TR-04a	TR4-1	TR-04a	TR-04a	TR4-1	TR4-1	TR-04b	TR-04b	TR-04b
Grain/ Analysis	14/27	14/28	14/29	14/30	15/29	15/31	15/32	16/30	16/31	16/33	16/34	16/35
Location	C	R	C	R	C	C	R	C	R	C	I	R
SiO_2	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fe_2O_3	1.65	1.63	1.33	1.50	1.66	1.43	1.45	1.46	1.63	1.30	1.34	1.31
La_2O_3	3.14	3.25	2.56	2.08	2.92	3.11	3.18	3.23	2.55	3.40	3.16	3.22
Sm_2O_3	0.21	0.22	0.26	0.18	0.21	0.27	0.27	0.20	0.18	0.28	0.27	0.26
Pr_2O_3	0.74	0.82	0.55	0.33	0.58	0.62	0.69	0.76	0.50	0.73	0.62	0.62
CaO	27.77	26.58	31.93	34.52	30.63	29.27	29.71	27.24	31.74	27.44	28.89	28.84
Nb_2O_5	2.36	2.78	1.13	1.30	1.26	1.48	1.44	2.87	1.66	3.21	2.64	2.44
SrO	0.77	0.79	0.72	0.81	0.76	0.79	0.77	0.76	0.76	0.81	0.76	0.78
ZrO_2	0.30	0.33	0.12	0.21	0.13	0.16	0.16	0.30	0.19	0.30	0.25	0.22
ThO_2	0.99	1.90	0.20	0.02	0.25	0.76	0.62	1.45	0.11	1.27	0.63	0.63
TiO_2	48.49	47.89	52.38	52.60	51.37	49.90	49.11	48.88	50.73	47.65	49.32	49.11
BaO	0.00	0.00	0.12	0.13	0.00	0.11	0.14	0.00	0.00	0.11	0.11	0.09
Ce_2O_3	7.51	8.06	5.53	3.68	6.44	7.22	7.14	7.87	5.36	7.84	7.14	7.18
Nd_2O_3	2.37	2.56	1.78	1.16	2.03	2.37	2.32	2.46	1.69	2.45	2.24	2.23
Na_2O	2.41	2.61	1.59	1.09	1.78	2.17	2.03	2.52	1.55	2.62	2.27	2.28
MgO	0.00	0.00	0.03	0.05	0.00	0.05	0.05	0.00	0.00	0.06	0.05	0.05
Al_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Ta_2O_5	0.00	0.00	0.10	0.01	0.00	0.22	0.13	0.00	0.00	0.32	0.17	0.14
Total	**98.73**	**99.45**	**100.34**	**99.66**	**100.01**	**99.93**	**99.20**	**99.99**	**98.65**	**99.79**	**99.84**	**99.38**
Si	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.031	0.031	0.027	0.027	0.031	0.027	0.025	0.028	0.030	0.025	0.025	0.023
La	0.029	0.030	0.018	0.029	0.026	0.029	0.032	0.030	0.023	0.029	0.030	0.026
Sm	0.002	0.002	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Pr	0.007	0.008	0.003	0.006	0.005	0.006	0.007	0.007	0.005	0.006	0.006	0.006
Ca	0.754	0.725	0.886	0.781	0.804	0.799	0.745	0.733	0.837	0.771	0.774	0.780
Nb	0.027	0.032	0.014	0.017	0.014	0.016	0.037	0.033	0.018	0.030	0.028	0.031
Sr	0.011	0.012	0.011	0.011	0.011	0.011	0.012	0.011	0.011	0.011	0.011	0.012
Zr	0.004	0.004	0.002	0.002	0.001	0.002	0.004	0.004	0.002	0.003	0.003	0.003
Th	0.006	0.011	0.000	0.004	0.001	0.004	0.007	0.008	0.001	0.004	0.004	0.003
Ti	0.924	0.917	0.948	0.935	0.947	0.927	0.908	0.924	0.940	0.925	0.925	0.927
Ba	0.000	0.000	0.001	0.001	0.000	0.001	0.001	0.000	0.000	0.001	0.001	0.001
Ce	0.070	0.075	0.032	0.066	0.058	0.066	0.073	0.072	0.048	0.065	0.066	0.061
Nd	0.021	0.023	0.010	0.021	0.018	0.021	0.022	0.022	0.015	0.020	0.020	0.019
Na	0.118	0.129	0.051	0.105	0.085	0.099	0.129	0.123	0.074	0.109	0.111	0.110
Mg	0.000	0.000	0.002	0.002	0.000	0.002	0.002	0.000	0.000	0.002	0.002	0.002
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ta	0.000	0.000	0.000	0.002	0.000	0.001	0.002	0.000	0.000	0.001	0.001	0.001
Cations	**2.005**	**1.999**	**2.008**	**2.009**	**2.002**	**2.015**	**2.007**	**1.996**	**2.006**	**2.004**	**2.007**	**2.005**
lueshite	0.03	0.01	0.01	0.01	0.03	0.02	0.02	0.02	0.02	0.04	0.03	0.03
loparite	0.20	0.14	0.13	0.07	0.18	0.18	0.17	0.11	0.20	0.19	0.16	0.17
$REEFeO_3$	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03
tausonite	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
$REE_2Ti_2O_7$	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.01	0.01
lakargiite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
perovskite	0.72	0.80	0.82	0.87	0.73	0.76	0.76	0.82	0.72	0.72	0.76	0.75
Fe/Nb	**1.16**	**0.98**	**1.92**	**1.61**	**2.18**	**1.68**	**0.67**	**0.85**	**1.63**	**0.84**	**0.89**	**0.74**
ΔNNO	**-3.01**	**-3.70**	**-2.48**	**-2.87**	**-1.60**	**-2.67**	**-5.92**	**-4.67**	**-2.26**	**-4.96**	**-4.80**	**-5.68**

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Supplementary Material B

Table B4. *Major element compostions of perovskite from TR-IV LM-I. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate.*

Sample	TR4-1	TR-04b	TR-07	TR4-1	TR4-1	TR-07	TR4-1	TR4-1	TR-18	TR-18	TR-18	TR4-2	TR4-2
Grain/ Analysis	17/32	17/36	17/37	18/33	18/34	18/38	19/35	19/36	19/39	19/40	19/41	20/37	20/38
Location	C	C	R	C	R	C	C	R	C	I	R	C	R
SiO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.05	0.00	0.00
Fe_2O_3	2.19	1.22	1.30	1.62	1.52	1.64	1.67	1.64	1.43	1.42	1.70	1.57	1.82
La_2O_3	3.51	2.80	1.80	3.15	2.83	2.87	3.13	3.17	3.14	3.27	2.97	3.38	2.57
Sm_2O_3	0.24	0.27	0.16	0.21	0.20	0.25	0.22	0.21	0.27	0.29	0.25	0.22	0.18
Pr_2O_3	0.77	0.61	0.31	0.77	0.63	0.56	0.76	0.76	0.69	0.63	0.48	0.79	0.49
CaO	26.42	29.28	34.69	28.09	30.58	31.02	28.14	28.58	27.50	28.29	30.94	26.31	31.81
Nb_2O_5	2.14	2.75	1.27	1.35	1.02	2.02	1.48	1.30	4.38	2.50	2.31	1.65	1.46
SrO	0.80	0.81	0.77	0.72	0.73	0.79	0.78	0.81	0.82	0.77	0.83	0.74	0.82
ZrO_2	0.26	0.27	0.16	0.14	0.10	0.33	0.15	0.14	0.58	0.23	0.34	0.15	0.20
ThO_2	0.95	0.62	0.01	1.22	0.54	0.05	1.30	1.18	1.42	0.81	0.24	1.18	0.06
TiO_2	47.91	49.57	53.00	49.61	51.12	49.98	49.73	49.75	46.75	48.10	50.39	48.76	50.97
BaO	0.00	0.11	0.12	0.00	0.00	0.12	0.00	0.00	0.12	0.10	0.12	0.00	0.00
Ce_2O_3	8.20	6.66	3.59	7.64	6.49	5.93	7.74	7.58	7.61	7.49	6.29	8.11	5.21
Nd_2O_3	2.55	2.10	1.13	2.49	2.11	1.79	2.50	2.45	2.29	2.31	1.91	2.60	1.67
Na_2O	2.48	2.29	1.36	2.09	1.83	1.86	2.14	2.07	2.75	2.25	1.76	2.64	1.46
MgO	0.00	0.04	0.03	0.00	0.00	0.04	0.00	0.00	0.06	0.35	0.10	0.00	0.00
Al_2O_3	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00
Ta_2O_5	0.00	0.18	0.04	0.00	0.00	0.05	0.00	0.00	0.00	0.17	0.03	0.00	0.00
Total	**98.42**	**99.58**	**99.74**	**99.08**	**99.69**	**99.30**	**99.75**	**99.63**	**99.80**	**99.22**	**100.70**	**98.10**	**98.74**
Si	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.001	0.000	0.000	0.000
Fe	0.042	0.023	0.030	0.031	0.028	0.027	0.032	0.031	0.027	0.031	0.028	0.030	0.034
La	0.033	0.016	0.026	0.029	0.026	0.029	0.029	0.029	0.030	0.027	0.030	0.032	0.023
Sm	0.002	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.002
Pr	0.007	0.003	0.005	0.007	0.006	0.006	0.007	0.007	0.006	0.004	0.006	0.007	0.004
Ca	0.725	0.887	0.820	0.759	0.807	0.746	0.756	0.767	0.763	0.809	0.774	0.722	0.837
Nb	0.025	0.014	0.023	0.015	0.011	0.050	0.017	0.015	0.028	0.026	0.027	0.019	0.016
Sr	0.012	0.011	0.011	0.010	0.010	0.012	0.011	0.012	0.011	0.012	0.012	0.011	0.012
Zr	0.003	0.002	0.004	0.002	0.001	0.007	0.002	0.002	0.003	0.004	0.003	0.002	0.002
Th	0.006	0.000	0.000	0.007	0.003	0.008	0.007	0.007	0.005	0.001	0.003	0.007	0.000
Ti	0.923	0.952	0.928	0.941	0.947	0.890	0.938	0.938	0.911	0.925	0.922	0.940	0.942
Ba	0.000	0.001	0.001	0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.001	0.000	0.000
Ce	0.077	0.031	0.054	0.071	0.059	0.070	0.071	0.070	0.069	0.056	0.069	0.076	0.047
Nd	0.023	0.010	0.016	0.022	0.019	0.021	0.022	0.022	0.021	0.017	0.020	0.024	0.015
Na	0.123	0.063	0.089	0.102	0.087	0.135	0.104	0.101	0.110	0.083	0.105	0.131	0.070
Mg	0.000	0.001	0.001	0.000	0.000	0.002	0.000	0.000	0.013	0.004	0.003	0.000	0.000
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Cations	**2.001**	**2.015**	**2.012**	**1.998**	**2.006**	**2.008**	**1.998**	**2.002**	**2.008**	**2.003**	**2.006**	**2.003**	**2.004**
lueshite	0.02	0.03	0.01	0.01	0.02	0.02	0.02	0.02	0.05	0.03	0.03	0.02	0.01
loparite	0.18	0.16	0.10	0.15	0.18	0.14	0.18	0.23	0.18	0.17	0.12	0.11	0.19
$REEFeO_3$	0.03	0.02	0.01	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
tausonite	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
$REE_2Ti_2O_7$	0.01	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.00	0.00
lakargiite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
perovskite	0.76	0.76	0.86	0.79	0.75	0.79	0.76	0.71	0.71	0.75	0.80	0.83	0.75
Fe/Nb	**1.70**	**1.70**	**1.35**	**2.00**	**2.49**	**0.54**	**1.88**	**2.10**	**0.95**	**1.22**	**1.05**	**1.58**	**2.07**
ΔNNO	**-0.05**	**-3.38**	**-2.71**	**-1.74**	**-1.87**	**-6.97**	**-1.72**	**-1.60**	**-4.31**	**-2.91**	**-3.76**	**-2.32**	**-1.12**

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OXYGEN FUGACITY OF THE ALTO PARANAÍBA KIMBERLITES AND DIAMOND INSTABILITY: TRÊS RANCHOS IV AND LIMEIRA I INTRUSIONS
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Supplementary Material B

Table B4. *Major element compostions of perovskite from TR-IV LM-I. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate.*

Sample	TR4-2	TR4-2	TR4-2	TR4-2	TR-18	TR4-2	TR4-2	TR4-2	TRIV-5	TRIV-5	TRIV-5	TRIV-5
Grain/ Analysis	21/39	21/40	22/41	22/42	22/44	23/43	24/45	24/46	25/47	26/49	26/50	27/51
Location	C	R	C	R	C	C	C	R	C	C	R	C
SiO_2	0.00	0.00	0.00	0.00	0.00	0.59	0.00	0.00	0.00	0.00	0.00	0.01
Fe_2O_3	1.53	1.57	1.76	1.69	4.00	2.00	1.59	1.48	2.22	1.61	1.56	1.62
La_2O_3	3.14	2.70	2.87	3.08	2.60	3.49	3.46	3.12	2.31	2.99	2.76	1.60
Sm_2O_3	0.20	0.19	0.21	0.19	0.23	0.22	0.24	0.21	0.17	0.21	0.19	0.13
Pr_2O_3	0.76	0.57	0.60	0.66	0.40	0.81	0.86	0.74	0.40	0.66	0.58	0.37
CaO	28.52	30.62	29.92	29.65	29.96	24.76	25.37	28.11	33.13	30.13	31.47	35.40
Nb_2O_5	1.16	0.98	2.03	1.64	1.19	2.39	2.24	1.70	1.10	1.10	1.09	0.45
SrO	0.77	0.72	0.77	0.76	0.73	0.75	0.76	0.70	0.29	0.29	0.25	0.22
ZrO_2	0.12	0.09	0.27	0.19	0.12	0.28	0.21	0.14	0.17	0.11	0.12	0.05
ThO_2	1.13	0.30	0.14	0.13	0.20	2.07	2.46	0.79	0.03	0.21	0.14	0.30
TiO_2	50.65	50.89	50.34	50.21	49.87	47.47	47.91	49.51	52.12	51.27	52.31	53.85
BaO	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ce_2O_3	7.55	5.83	6.55	6.80	5.58	8.48	8.56	7.41	4.45	6.69	6.18	3.38
Nd_2O_3	2.42	1.85	2.08	2.16	1.80	2.66	2.72	2.38	1.33	2.05	1.87	1.20
Na_2O	2.20	1.77	2.08	1.99	1.86	2.78	2.84	2.16	1.36	1.88	1.77	0.88
MgO	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Al_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ta_2O_5	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**100.15**	**98.09**	**99.61**	**99.14**	**98.90**	**98.75**	**99.22**	**98.46**	**99.09**	**99.21**	**100.29**	**99.45**
Si	0.000	0.000	0.000	0.000	0.002	0.015	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.029	0.029	0.033	0.032	0.028	0.039	0.031	0.028	0.040	0.030	0.028	0.029
La	0.029	0.025	0.026	0.028	0.031	0.033	0.033	0.029	0.021	0.027	0.025	0.014
Sm	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.001	0.002	0.002	0.001
Pr	0.007	0.005	0.005	0.006	0.007	0.008	0.008	0.007	0.004	0.006	0.005	0.003
Ca	0.759	0.815	0.791	0.789	0.747	0.680	0.698	0.761	0.858	0.797	0.817	0.902
Nb	0.013	0.011	0.023	0.018	0.019	0.028	0.026	0.019	0.012	0.012	0.012	0.005
Sr	0.011	0.010	0.011	0.011	0.011	0.011	0.011	0.010	0.004	0.004	0.004	0.003
Zr	0.002	0.001	0.003	0.002	0.002	0.003	0.003	0.002	0.002	0.001	0.001	0.001
Th	0.006	0.002	0.001	0.001	0.004	0.012	0.014	0.005	0.000	0.001	0.001	0.002
Ti	0.947	0.951	0.934	0.939	0.935	0.916	0.926	0.941	0.948	0.952	0.954	0.964
Ba	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ce	0.069	0.053	0.059	0.062	0.069	0.080	0.081	0.069	0.039	0.060	0.055	0.029
Nd	0.021	0.016	0.018	0.019	0.022	0.024	0.025	0.021	0.011	0.018	0.016	0.010
Na	0.106	0.085	0.099	0.096	0.126	0.138	0.141	0.106	0.064	0.090	0.083	0.040
Mg	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ta	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cations	**2.001**	**2.007**	**2.006**	**2.005**	**2.010**	**1.989**	**1.999**	**1.999**	**2.01**	**2.001**	**2.002**	**2.004**
lueshite	0.01	0.02	0.02	0.03	0.02	0.02	0.03	0.02	0.01	0.01	0.01	0.00
loparite	0.15	0.15	0.16	0.22	0.12	0.15	0.23	0.18	0.10	0.16	0.14	0.07
$REEFeO_3$	0.03	0.03	0.03	0.04	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.02
tausonite	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
$REE_2Ti_2O_7$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
lakargiite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
perovskite	0.80	0.77	0.78	0.69	0.82	0.77	0.69	0.76	0.85	0.79	0.81	0.90
Fe/Nb	**2.19**	**2.68**	**1.44**	**1.72**	**1.42**	**1.39**	**1.18**	**1.45**	**3.36**	**2.43**	**2.39**	**6.00**
ΔNNO	**-1.98**	**-1.53**	**-2.16**	**-1.90**	**-3.02**	**-1.32**	**-3.07**	**-2.89**	**1.09**	**-1.57**	**-1.87**	**-0.85**

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OXYGEN FUGACITY OF THE ALTO PARANAÍBA KIMBERLITES AND DIAMOND INSTABILITY: TRÊS RANCHOS IV AND LIMEIRA I INTRUSIONS
Bruna Coldebella, Rogério Guitarrari Azzone, Luanna Chmyz, Excelso Ruberti, Darcy P. Svisero

Supplementary Material B

Table B4. *Major element compostions of perovskite from TR-IV LM-I. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate.*

Sample	TRIV-5	TRIV-5	TRIV-5	TRIV-5	TRIV-5	TRIV-5	TRIV-5	TRIV-5	TRIV-5	TRIV-5	TRIV-5
Grain/ Analysis	27/52	28/53	29/55	30/56	31/58	31/59	32/60	32/61	33/62	33/63	34/64
Location	R	C	R	C	C	R	C	R	C	R	R
SiO_2	0.00	0.00	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fe_2O_3	1.62	1.78	2.72	1.79	1.57	1.99	1.58	1.74	1.81	1.97	1.85
La_2O_3	1.52	2.65	2.51	3.51	2.92	2.36	2.66	2.38	2.53	2.45	2.90
Sm_2O_3	0.12	0.18	0.15	0.23	0.19	0.16	0.18	0.16	0.18	0.17	0.19
Pr_2O_3	0.33	0.54	0.43	0.80	0.62	0.43	0.58	0.45	0.50	0.46	0.62
CaO	34.86	31.26	32.53	27.31	30.52	33.47	31.43	32.71	32.37	32.75	29.79
Nb_2O_5	0.43	1.07	1.68	1.65	1.00	1.11	0.86	0.87	1.00	1.08	1.19
SrO	0.21	0.27	0.36	0.28	0.29	0.32	0.29	0.28	0.30	0.30	0.29
ZrO_2	0.03	0.16	0.59	0.19	0.10	0.16	0.09	0.09	0.12	0.14	0.15
ThO_2	0.27	0.05	0.04	0.87	0.34	0.04	0.19	0.04	0.13	0.04	0.13
TiO_2	53.52	51.74	50.57	49.48	51.46	52.44	52.18	52.15	52.50	51.95	51.03
BaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ce_2O_3	3.31	5.65	4.56	8.21	6.47	4.68	5.87	4.88	5.40	4.90	6.51
Nd_2O_3	1.16	1.78	1.34	2.59	2.08	1.43	1.87	1.52	1.69	1.54	2.03
Na_2O	0.96	1.69	1.29	2.38	1.78	1.28	1.68	1.40	1.54	1.39	1.91
MgO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Al_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ta_2O_5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**98.33**	**98.83**	**99.99**	**99.28**	**99.33**	**99.86**	**99.45**	**98.66**	**100.07**	**99.14**	**98.57**
Si	0.000	0.000	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.029	0.033	0.049	0.034	0.029	0.036	0.029	0.032	0.033	0.036	0.034
La	0.013	0.024	0.022	0.033	0.027	0.021	0.024	0.021	0.023	0.022	0.027
Sm	0.001	0.002	0.001	0.002	0.002	0.001	0.002	0.001	0.002	0.001	0.002
Pr	0.003	0.005	0.004	0.007	0.006	0.004	0.005	0.004	0.004	0.004	0.006
Ca	0.897	0.821	0.835	0.737	0.805	0.862	0.821	0.853	0.837	0.852	0.791
Nb	0.005	0.012	0.018	0.019	0.011	0.012	0.009	0.010	0.011	0.012	0.013
Sr	0.003	0.004	0.005	0.004	0.004	0.005	0.004	0.004	0.004	0.004	0.004
Zr	0.000	0.002	0.007	0.002	0.001	0.002	0.001	0.001	0.001	0.002	0.002
Th	0.001	0.000	0.000	0.005	0.002	0.000	0.001	0.000	0.001	0.000	0.001
Ti	0.967	0.954	0.911	0.938	0.953	0.948	0.957	0.955	0.953	0.949	0.951
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ce	0.029	0.051	0.040	0.076	0.058	0.041	0.052	0.043	0.048	0.044	0.059
Nd	0.010	0.016	0.011	0.023	0.018	0.012	0.016	0.013	0.015	0.013	0.018
Na	0.045	0.080	0.060	0.116	0.085	0.060	0.079	0.066	0.072	0.065	0.092
Mg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cations	**2.004**	**2.002**	**1.992**	**1.997**	**2.000**	**2.004**	**2.002**	**2.005**	**2.003**	**2.004**	**1.999**
lueshite	0.00	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
loparite	0.08	0.14	0.09	0.20	0.15	0.10	0.14	0.11	0.12	0.11	0.16
$REEFeO_3$	0.02	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
tausonite	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$REE_2Ti_2O_7$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
lakargiite	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
perovskite	0.89	0.82	0.85	0.74	0.80	0.85	0.82	0.84	0.83	0.84	0.79
Fe/Nb	**6.33**	**2.76**	**2.69**	**1.81**	**2.62**	**2.99**	**3.07**	**3.32**	**3.01**	**3.03**	**2.59**
ΔNNO	**-0.76**	**-0.78**	**2.48**	**-1.36**	**-1.62**	**-0.01**	**-1.43**	**-0.73**	**-0.65**	**0.01**	**-0.54**

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Supplementary Material B

Table B4. *Major element compostions of perovskite from TR-IV LM-I. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate.*

Sample	TRIV-5-3	TRIV-5-3	TRIV-5-3	TRIV-5-3	TRIV-5-3	TRIV-5-3	TRIV-5-3	TRIV-5-3	TRIV-5-3
Grain/ Analysis	35/65	35/66	36/67	36/68	37/69	37/70	38/71	38/72	39/73
Location	C	R	C	R	C	R	C	R	R
SiO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00
Fe_2O_3	1.79	1.85	1.53	1.81	1.39	1.55	1.90	1.78	1.69
La_2O_3	3.51	3.20	3.41	2.65	2.76	2.15	2.46	2.52	3.70
Sm_2O_3	0.23	0.20	0.23	0.17	0.19	0.15	0.16	0.18	0.24
Pr_2O_3	0.79	0.69	0.78	0.53	0.66	0.41	0.45	0.47	0.84
CaO	27.53	29.41	27.46	32.57	30.25	33.45	32.91	32.71	26.00
Nb_2O_5	1.46	1.33	1.34	1.11	0.86	0.84	1.17	1.09	1.80
SrO	0.26	0.30	0.29	0.28	0.26	0.27	0.28	0.31	0.30
ZrO_2	0.17	0.18	0.14	0.17	0.09	0.10	0.16	0.13	0.24
ThO_2	0.57	0.21	1.11	0.03	0.63	0.03	0.02	0.04	1.51
TiO_2	49.56	50.88	49.87	51.92	51.74	52.80	52.01	52.49	48.38
BaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ce_2O_3	7.97	7.12	8.06	5.21	6.71	4.47	4.90	5.18	8.61
Nd_2O_3	2.48	2.23	2.53	1.61	2.15	1.41	1.50	1.65	2.55
Na_2O	2.23	2.07	2.34	1.44	1.88	1.29	1.24	1.45	2.45
MgO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Al_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ta_2O_5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**98.55**	**99.67**	**99.08**	**99.50**	**99.58**	**98.93**	**99.23**	**99.99**	**98.30**
Si	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
Fe	0.034	0.034	0.029	0.033	0.026	0.028	0.035	0.032	0.033
La	0.033	0.029	0.032	0.024	0.025	0.019	0.022	0.022	0.035
Sm	0.002	0.002	0.002	0.001	0.002	0.001	0.001	0.001	0.002
Pr	0.007	0.006	0.007	0.005	0.006	0.004	0.004	0.004	0.008
Ca	0.746	0.778	0.742	0.847	0.797	0.866	0.854	0.845	0.716
Nb	0.017	0.015	0.015	0.012	0.010	0.009	0.013	0.012	0.021
Sr	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.005
Zr	0.002	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.003
Th	0.003	0.001	0.006	0.000	0.004	0.000	0.000	0.000	0.009
Ti	0.943	0.945	0.946	0.948	0.957	0.959	0.948	0.952	0.935
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ce	0.074	0.064	0.074	0.046	0.060	0.040	0.043	0.046	0.081
Nd	0.022	0.020	0.023	0.014	0.019	0.012	0.013	0.014	0.023
Na	0.109	0.099	0.114	0.068	0.090	0.060	0.058	0.068	0.122
Mg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cations	**1.996**	**2.001**	**1.997**	**2.004**	**2.000**	**2.004**	**1.999**	**2.002**	**1.992**
lueshite	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.02
loparite	0.19	0.17	0.20	0.11	0.16	0.10	0.09	0.11	0.21
$REEFeO_3$	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03
tausonite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$REE_2Ti_2O_7$	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
lakargiite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
perovskite	0.75	0.77	0.74	0.84	0.79	0.86	0.85	0.84	0.72
Fe/Nb	**2.04**	**2.31**	**1.90**	**2.70**	**2.70**	**3.08**	**2.69**	**2.71**	**1.56**
ΔNNO	**-1.07**	**-0.76**	**-2.16**	**-0.77**	**-2.27**	**-1.60**	**-0.45**	**-0.92**	**-1.95**

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Supplementary Material B

Table B4. *Major element compostions of perovskite from TR-IV LM-I. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate.*

Sample	TRIV-5-3	TRIV-5-3	TRIV-5-3	TRIV-5-3	TRIV-5-3	TRIV-5-3	TRIV-5-3	TRIV-5-3	TRIV-5-3
Grain/ Analysis	39/74	41/77	42/78	42/79	43/80	45/83	46/84	47/86	47/87
Location	C	C	C	R	C	R	C	C	R
SiO_2	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00
Fe_2O_3	1.16	1.96	1.62	1.60	1.64	1.41	1.53	1.19	1.37
La_2O_3	1.44	3.04	3.45	3.21	3.20	2.62	3.27	2.54	1.79
Sm_2O_3	0.12	0.19	0.23	0.21	0.22	0.17	0.21	0.19	0.14
Pr_2O_3	0.32	0.59	0.77	0.68	0.69	0.59	0.73	0.65	0.33
CaO	35.44	30.76	27.75	28.90	29.05	32.31	28.41	30.55	34.34
Nb_2O_5	0.66	1.54	1.51	1.30	1.13	0.78	1.12	0.78	0.75
SrO	0.24	0.36	0.30	0.30	0.28	0.31	0.31	0.27	0.26
ZrO_2	0.05	0.29	0.13	0.13	0.13	0.08	0.10	0.07	0.06
ThO_2	0.12	0.07	0.76	0.33	0.27	0.40	0.89	0.99	0.04
TiO_2	55.05	50.35	49.82	50.88	50.48	52.09	50.15	52.34	53.14
BaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ce_2O_3	3.08	6.26	7.89	7.33	7.12	5.97	7.65	6.51	3.54
Nd_2O_3	0.99	1.90	2.43	2.30	2.23	1.94	2.37	2.16	1.10
Na_2O	1.21	1.52	2.23	2.23	2.00	1.48	2.17	1.92	1.16
MgO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Al_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ta_2O_5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**99.86**	**98.83**	**98.93**	**99.40**	**98.43**	**100.16**	**98.90**	**100.16**	**98.00**
Si	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.020	0.037	0.031	0.030	0.031	0.026	0.029	0.022	0.025
La	0.012	0.028	0.032	0.029	0.030	0.023	0.030	0.023	0.016
Sm	0.001	0.002	0.002	0.002	0.002	0.001	0.002	0.002	0.001
Pr	0.003	0.005	0.007	0.006	0.006	0.005	0.007	0.006	0.003
Ca	0.893	0.816	0.748	0.768	0.779	0.841	0.764	0.799	0.888
Nb	0.007	0.017	0.017	0.015	0.013	0.009	0.013	0.009	0.008
Sr	0.003	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Zr	0.001	0.003	0.002	0.002	0.002	0.001	0.001	0.001	0.001
Th	0.001	0.000	0.004	0.002	0.002	0.002	0.005	0.005	0.000
Ti	0.974	0.937	0.943	0.950	0.950	0.952	0.947	0.962	0.965
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ce	0.027	0.057	0.073	0.067	0.065	0.053	0.070	0.058	0.031
Nd	0.008	0.017	0.022	0.020	0.020	0.017	0.021	0.019	0.009
Na	0.055	0.073	0.109	0.107	0.097	0.070	0.106	0.091	0.054
Mg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cations	**2.006**	**1.997**	**1.995**	**2.002**	**1.999**	**2.004**	**2.000**	**2.000**	**2.006**
lueshite	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
loparite	0.10	0.11	0.19	0.19	0.17	0.12	0.19	0.17	0.09
$REEFeO_3$	0.00	0.04	0.03	0.03	0.03	0.03	0.03	0.02	0.01
tausonite	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$REE_2Ti_2O_7$	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00
lakargiite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
perovskite	0.89	0.82	0.75	0.76	0.78	0.83	0.76	0.80	0.88
Fe/Nb	**2.93**	**2.12**	**1.79**	**2.04**	**2.42**	**3.03**	**2.27**	**2.55**	**3.05**
ΔNNO	**-3.26**	**-0.53**	**-1.98**	**-1.86**	**-1.37**	**-2.12**	**-1.86**	**-3.09**	**-2.30**

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Supplementary Material B

Table B4. *Major element compostions of perovskite from TR-IV LM-I. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate.*

Sample	TRIV-5-3	TRIV-5-3	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2
Grain/ Analysis	49/89	49/90	01/01	01/02	02/03	02/04	03/05	03/06	04/07	04/08	05/09	05/10	06/11
Location	C	R	R	C	C	R	C	R	C	R	C	R	C
SiO_2	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fe_2O_3	1.59	1.97	2.07	1.97	2.05	2.10	1.93	1.93	1.46	1.33	1.82	1.81	1.49
La_2O_3	2.86	2.51	1.21	1.05	0.93	0.90	1.24	1.20	1.49	1.34	1.59	1.51	1.27
Sm_2O_3	0.18	0.17	0.16	0.13	0.11	0.10	0.16	0.16	0.24	0.18	0.21	0.21	0.18
Pr_2O_3	0.58	0.47	0.37	0.31	0.24	0.24	0.40	0.39	0.59	0.39	0.51	0.47	0.39
CaO	31.08	32.44	35.99	36.91	37.84	37.95	35.87	36.14	33.14	35.43	34.19	34.52	35.34
Nb_2O_5	1.13	1.28	0.44	0.35	0.42	0.45	0.45	0.42	1.21	1.06	1.28	1.15	1.12
SrO	0.30	0.31	0.41	0.43	0.49	0.46	0.41	0.43	0.35	0.38	0.39	0.37	0.37
ZrO_2	0.13	0.20	0.09	0.08	0.09	0.11	0.08	0.09	0.15	0.16	0.28	0.25	0.18
ThO_2	0.22	0.05	0.35	0.21	0.07	0.09	0.45	0.39	0.97	0.05	0.21	0.30	0.08
TiO_2	51.95	50.94	52.48	53.17	53.76	53.86	52.98	53.14	52.12	53.36	52.26	52.13	53.20
BaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ce_2O_3	6.11	4.85	3.29	2.85	2.16	2.11	3.46	3.38	4.86	3.63	4.46	4.18	3.50
Nd_2O_3	1.97	1.49	1.41	1.22	0.87	0.83	1.52	1.50	2.22	1.48	1.90	1.82	1.49
Na_2O	1.72	1.34	0.48	0.40	0.27	0.28	0.52	0.52	1.08	0.81	0.83	0.76	0.80
MgO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Al_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ta_2O_5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**99.82**	**98.09**	**98.75**	**99.06**	**99.32**	**99.49**	**99.47**	**99.69**	**99.87**	**99.61**	**99.93**	**99.48**	**99.40**
Si	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.029	0.036	0.037	0.035	0.036	0.037	0.035	0.035	0.027	0.024	0.033	0.033	0.027
La	0.026	0.023	0.011	0.009	0.008	0.008	0.011	0.011	0.013	0.012	0.014	0.013	0.011
Sm	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002
Pr	0.005	0.004	0.003	0.003	0.002	0.002	0.003	0.003	0.005	0.003	0.005	0.004	0.003
Ca	0.812	0.854	0.927	0.941	0.956	0.956	0.918	0.922	0.860	0.904	0.880	0.891	0.903
Nb	0.012	0.014	0.005	0.004	0.005	0.005	0.005	0.004	0.013	0.011	0.014	0.012	0.012
Sr	0.004	0.004	0.006	0.006	0.007	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005
Zr	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.002
Th	0.001	0.000	0.002	0.001	0.000	0.000	0.002	0.002	0.005	0.000	0.001	0.002	0.000
Ti	0.953	0.942	0.949	0.952	0.953	0.953	0.952	0.952	0.949	0.956	0.944	0.944	0.955
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ce	0.055	0.044	0.029	0.025	0.019	0.018	0.030	0.029	0.043	0.032	0.039	0.037	0.031
Nd	0.017	0.013	0.012	0.010	0.007	0.007	0.013	0.013	0.019	0.013	0.016	0.016	0.013
Na	0.081	0.064	0.022	0.019	0.013	0.013	0.024	0.024	0.051	0.037	0.039	0.036	0.037
Mg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cations	**1.999**	**2.004**	**2.005**	**2.008**	**2.008**	**2.008**	**2.002**	**2.004**	**1.994**	**2.001**	**1.995**	**1.998**	**2.000**
lueshite	0.01	0.01	0.00	0.00	0.00	-0.01	0.00	-0.01	0.01	-0.01	0.01	-0.01	0.01
loparite	0.14	0.10	0.04	0.03	0.02	0.02	0.04	0.04	0.08	0.05	0.05	0.05	0.05
$REEFeO_3$	0.03	0.04	0.04	0.03	0.03	0.03	0.04	0.03	0.03	0.02	0.03	0.03	0.03
tausonite	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01
$REE_2Ti_2O_7$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00
lakargiite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
perovskite	0.81	0.84	0.91	0.93	0.94	0.94	0.91	0.91	0.87	0.90	0.88	0.89	0.90
Fe/Nb	**2.35**	**2.57**	**7.83**	**9.30**	**8.07**	**7.74**	**7.17**	**7.69**	**2.01**	**2.09**	**2.37**	**2.63**	**2.22**
ΔNNO	**-1.76**	**-0.17**	**1.26**	**0.85**	**1.03**	**1.19**	**0.57**	**0.59**	**-2.50**	**-2.95**	**-1.01**	**-0.86**	**-2.32**

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Supplementary Material B

Table B4. *Major element compostions of perovskite from TR-IV LM-I. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate.*

Sample	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM3-1	LM3-1	LM3-1	LM3-1
Grain/ Analysis	06/12	07/13	07/14	08/15	08/16	09/17	09/18	10/19	10/20	11/21	11/22	12/23	12/24
Location	R	C	R	C	R	C	R	C	R	C	R	C	R
SiO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fe_2O_3	1.76	1.28	1.38	1.58	1.48	1.96	1.96	1.92	1.91	1.24	1.24	1.98	2.01
La_2O_3	1.43	1.21	0.94	1.66	1.29	1.12	1.15	1.13	1.09	1.54	1.31	1.18	1.07
Sm_2O_3	0.21	0.21	0.12	0.21	0.17	0.14	0.14	0.15	0.14	0.24	0.20	0.17	0.14
Pr_2O_3	0.47	0.44	0.26	0.48	0.36	0.33	0.34	0.33	0.28	0.61	0.46	0.39	0.33
CaO	32.72	35.13	36.99	33.86	35.52	36.71	36.55	36.50	36.86	32.98	34.55	36.15	36.48
Nb_2O_5	1.32	0.67	0.56	1.56	1.03	0.43	0.42	0.42	0.42	1.29	0.97	0.41	0.42
SrO	0.35	0.34	0.35	0.39	0.30	0.42	0.47	0.42	0.42	0.37	0.38	0.43	0.44
ZrO_2	1.29	0.13	0.16	0.18	0.20	0.08	0.10	0.10	0.10	0.13	0.11	0.10	0.08
ThO_2	0.33	0.47	0.01	0.02	0.00	0.26	0.33	0.23	0.22	0.83	0.53	0.35	0.22
TiO_2	51.27	52.96	54.10	51.78	53.13	53.00	53.01	53.07	53.11	51.64	52.43	52.78	53.06
BaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ce_2O_3	4.12	3.82	2.41	4.44	3.21	2.90	3.08	2.91	2.83	4.93	3.96	3.23	2.84
Nd_2O_3	1.76	1.79	1.00	1.81	1.27	1.25	1.30	1.23	1.21	2.23	1.78	1.42	1.21
Na_2O	1.01	0.74	0.52	0.99	0.78	0.41	0.46	0.42	0.44	1.07	0.87	0.49	0.42
MgO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Al_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ta_2O_5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**98.04**	**99.18**	**98.82**	**98.97**	**98.74**	**99.02**	**99.30**	**98.82**	**99.03**	**99.10**	**98.80**	**99.09**	**98.72**
Si	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.032	0.023	0.025	0.029	0.027	0.035	0.035	0.035	0.034	0.023	0.023	0.036	0.036
La	0.013	0.011	0.008	0.015	0.011	0.010	0.010	0.010	0.010	0.014	0.012	0.010	0.009
Sm	0.002	0.002	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.001
Pr	0.004	0.004	0.002	0.004	0.003	0.003	0.003	0.003	0.002	0.005	0.004	0.003	0.003
Ca	0.858	0.904	0.939	0.879	0.910	0.938	0.933	0.934	0.941	0.863	0.895	0.927	0.934
Nb	0.015	0.007	0.006	0.017	0.011	0.005	0.005	0.005	0.004	0.014	0.011	0.004	0.004
Sr	0.005	0.005	0.005	0.005	0.004	0.006	0.006	0.006	0.006	0.005	0.005	0.006	0.006
Zr	0.015	0.001	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001
Th	0.002	0.003	0.000	0.000	0.000	0.001	0.002	0.001	0.001	0.005	0.003	0.002	0.001
Ti	0.944	0.957	0.964	0.944	0.956	0.951	0.951	0.954	0.952	0.949	0.954	0.951	0.954
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ce	0.037	0.034	0.021	0.039	0.028	0.025	0.027	0.025	0.025	0.044	0.035	0.028	0.025
Nd	0.015	0.015	0.008	0.016	0.011	0.011	0.011	0.010	0.010	0.019	0.015	0.012	0.010
Na	0.048	0.035	0.024	0.047	0.036	0.019	0.021	0.019	0.020	0.051	0.041	0.023	0.020
Mg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cations	**1.989**	**2.001**	**2.004**	**1.999**	**2.002**	**2.007**	**2.007**	**2.004**	**2.008**	**1.995**	**2.001**	**2.006**	**2.005**
lueshite	-0.02	0.01	-0.02	0.02	-0.02	0.00	-0.03	0.00	-0.03	0.01	-0.03	0.00	-0.04
loparite	0.07	0.06	0.04	0.06	0.05	0.03	0.03	0.03	0.03	0.07	0.06	0.04	0.03
$REEFeO_3$	0.03	0.02	0.02	0.03	0.03	0.04	0.04	0.03	0.03	0.02	0.02	0.04	0.03
tausonite	0.01	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
$REE_2Ti_2O_7$	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00
lakargiite	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
perovskite	0.86	0.90	0.93	0.88	0.90	0.92	0.92	0.92	0.92	0.87	0.89	0.91	0.92
Fe/Nb	**2.23**	**3.14**	**4.08**	**1.69**	**2.40**	**7.63**	**7.73**	**7.54**	**7.65**	**1.60**	**2.15**	**8.08**	**8.06**
ΔNNO	**-1.22**	**-2.65**	**-2.10**	**-2.43**	**-2.23**	**0.72**	**0.72**	**0.56**	**0.50**	**-3.58**	**-3.15**	**0.87**	**0.97**

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Supplementary Material B

Table B4. *Major element compostions of perovskite from TR-IV LM-I. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate.*

Sample	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2
Grain/ Analysis	13/26	14/27	15/28	16/29	16/30	17/31	17/32	18/33	18/34	18/35	19/36	19/37
Location	R	R	C	C	R	C	R	C	I	R	C	I
SiO_2	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fe_2O_3	1.47	1.53	1.40	1.48	1.50	2.37	2.27	1.44	1.51	1.73	1.41	1.32
La_2O_3	1.14	1.11	1.21	1.35	1.28	1.04	1.04	1.30	1.37	0.95	1.23	1.07
Sm_2O_3	0.17	0.12	0.17	0.22	0.21	0.13	0.12	0.20	0.22	0.14	0.20	0.16
Pr_2O_3	0.38	0.21	0.39	0.49	0.47	0.33	0.32	0.46	0.51	0.25	0.46	0.33
CaO	35.66	36.71	35.89	34.32	34.09	36.58	36.63	34.79	34.06	37.18	34.47	36.25
Nb_2O_5	0.73	1.22	1.08	0.75	0.92	0.33	0.42	0.88	0.91	0.65	0.92	0.64
SrO	0.37	0.37	0.34	0.36	0.35	0.45	0.47	0.36	0.36	0.37	0.33	0.34
ZrO_2	0.19	0.28	0.14	0.18	0.17	0.08	0.11	0.17	0.18	0.21	0.14	0.12
ThO_2	0.17	0.00	0.34	0.77	0.79	0.28	0.20	0.32	0.72	0.03	0.75	0.13
TiO_2	52.85	53.73	53.48	52.40	52.37	52.87	52.89	53.10	52.82	54.04	52.64	54.07
BaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ce_2O_3	3.22	2.19	3.33	4.17	3.99	2.91	2.67	3.95	4.36	2.33	3.89	3.00
Nd_2O_3	1.43	0.78	1.45	1.91	1.88	1.23	1.08	1.78	2.01	0.96	1.79	1.35
Na_2O	0.72	0.61	0.65	0.85	0.79	0.36	0.34	0.87	0.96	0.54	0.87	0.68
MgO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Al_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ta_2O_5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**98.50**	**98.84**	**99.85**	**99.25**	**98.81**	**98.96**	**98.57**	**99.62**	**99.99**	**99.39**	**99.10**	**99.46**
Si	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.027	0.027	0.025	0.027	0.027	0.043	0.041	0.026	0.027	0.031	0.026	0.024
La	0.010	0.010	0.011	0.012	0.011	0.009	0.009	0.011	0.012	0.008	0.011	0.009
Sm	0.001	0.001	0.001	0.002	0.002	0.001	0.001	0.002	0.002	0.001	0.002	0.001
Pr	0.003	0.002	0.003	0.004	0.004	0.003	0.003	0.004	0.005	0.002	0.004	0.003
Ca	0.918	0.931	0.913	0.889	0.885	0.935	0.938	0.892	0.876	0.939	0.891	0.920
Nb	0.008	0.013	0.012	0.008	0.010	0.004	0.005	0.010	0.010	0.007	0.010	0.007
Sr	0.005	0.005	0.005	0.005	0.005	0.006	0.007	0.005	0.005	0.005	0.005	0.005
Zr	0.002	0.003	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.002	0.002	0.001
Th	0.001	0.000	0.002	0.004	0.004	0.002	0.001	0.002	0.004	0.000	0.004	0.001
Ti	0.955	0.957	0.955	0.953	0.955	0.949	0.951	0.956	0.954	0.958	0.955	0.963
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ce	0.028	0.019	0.029	0.037	0.035	0.025	0.023	0.035	0.038	0.020	0.034	0.026
Nd	0.012	0.007	0.012	0.016	0.016	0.010	0.009	0.015	0.017	0.008	0.015	0.011
Na	0.034	0.028	0.030	0.040	0.037	0.017	0.016	0.040	0.045	0.025	0.041	0.031
Mg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cations	**2.005**	**2.002**	**1.998**	**1.999**	**1.994**	**2.005**	**2.005**	**2.000**	**1.997**	**2.006**	**1.999**	**2.003**
lueshite	-0.04	-0.04	0.01	0.01	-0.05	0.00	-0.05	0.01	0.01	-0.05	0.01	0.01
loparite	0.05	0.03	0.04	0.06	0.05	0.03	0.02	0.06	0.07	0.04	0.06	0.05
$REEFeO_3$	0.03	0.02	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.02	0.03	0.02
tausonite	0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00
$REE_2Ti_2O_7$	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.01	0.00
lakargiite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
perovskite	0.90	0.93	0.91	0.89	0.89	0.93	0.93	0.89	0.88	0.93	0.89	0.91
Fe/Nb	**3.37**	**2.08**	**2.15**	**3.30**	**2.70**	**11.80**	**9.07**	**2.72**	**2.77**	**4.40**	**2.55**	**3.45**
ΔNNO	**-1.84**	**-2.32**	**-2.72**	**-1.79**	**-1.93**	**2.69**	**2.14**	**-2.21**	**-1.91**	**-0.70**	**-2.36**	**-2.45**

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OXYGEN FUGACITY OF THE ALTO PARANAÍBA KIMBERLITES AND DIAMOND INSTABILITY: TRÊS RANCHOS IV AND LIMEIRA I INTRUSIONS
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Supplementary Material B

Table B4. *Major element compostions of perovskite from TR-IV LM-I. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate.*

Sample	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LMIC1	LMIC1	LMIC1	LMIC1	LMIC1
Grain/ Analysis	19/38	19/39	19/40	20/41	20/42	21/45	21/46	29/58	30/60	30/61	31/62	31/63
Location	I	I	R	C	R	C	R	C	C	R	R	C
SiO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fe_2O_3	1.32	1.39	1.55	2.41	1.39	1.54	1.89	1.39	2.04	1.22	1.36	1.31
La_2O_3	1.11	1.17	0.92	1.31	1.26	1.25	0.94	1.69	1.52	1.00	1.27	1.40
Sm_2O_3	0.19	0.18	0.13	0.18	0.18	0.18	0.11	0.22	0.23	0.12	0.21	0.24
Pr_2O_3	0.38	0.38	0.25	0.39	0.41	0.37	0.21	0.59	0.51	0.25	0.50	0.53
CaO	36.02	36.00	37.42	34.93	35.52	35.78	37.18	33.53	34.17	37.16	34.90	33.92
Nb_2O_5	0.62	0.63	0.60	1.02	1.10	1.11	0.71	1.11	1.50	0.63	0.63	0.72
SrO	0.35	0.32	0.35	0.35	0.36	0.36	0.38	0.14	0.12	0.13	0.12	0.13
ZrO_2	0.11	0.12	0.19	0.14	0.16	0.26	0.24	0.14	0.34	0.16	0.15	0.14
ThO_2	0.23	0.28	0.02	0.05	0.17	0.08	0.01	0.28	0.42	0.09	0.57	1.09
TiO_2	53.87	53.87	55.10	53.22	54.02	53.36	54.66	52.57	51.79	54.51	53.90	52.71
BaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ce_2O_3	3.26	3.38	2.27	3.51	3.63	3.39	2.11	4.99	4.43	2.25	4.10	4.45
Nd_2O_3	1.50	1.54	0.92	1.53	1.58	1.45	0.81	2.17	1.88	0.83	1.90	2.09
Na_2O	0.68	0.75	0.50	0.89	0.88	0.78	0.56	0.99	0.83	0.58	0.81	0.92
MgO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Al_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ta_2O_5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**99.65**	**100.00**	**100.22**	**99.92**	**100.68**	**99.92**	**99.79**	**99.81**	**99.78**	**98.94**	**100.41**	**99.65**
Si	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.024	0.025	0.027	0.043	0.025	0.027	0.033	0.025	0.037	0.022	0.024	0.024
La	0.010	0.010	0.008	0.011	0.011	0.011	0.008	0.015	0.013	0.009	0.011	0.012
Sm	0.002	0.002	0.001	0.001	0.002	0.001	0.001	0.002	0.002	0.001	0.002	0.002
Pr	0.003	0.003	0.002	0.003	0.004	0.003	0.002	0.005	0.005	0.002	0.004	0.005
Ca	0.916	0.913	0.934	0.888	0.897	0.909	0.932	0.866	0.881	0.939	0.888	0.877
Nb	0.007	0.007	0.006	0.011	0.012	0.012	0.007	0.012	0.016	0.007	0.007	0.008
Sr	0.005	0.004	0.005	0.005	0.005	0.005	0.005	0.002	0.002	0.002	0.002	0.002
Zr	0.001	0.001	0.002	0.002	0.002	0.003	0.003	0.002	0.004	0.002	0.002	0.002
Th	0.001	0.002	0.000	0.000	0.001	0.000	0.000	0.002	0.002	0.000	0.003	0.006
Ti	0.962	0.960	0.966	0.950	0.958	0.952	0.962	0.954	0.938	0.967	0.963	0.957
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ce	0.028	0.029	0.019	0.031	0.031	0.029	0.018	0.044	0.039	0.019	0.036	0.039
Nd	0.013	0.013	0.008	0.013	0.013	0.012	0.007	0.019	0.016	0.007	0.016	0.018
Na	0.031	0.034	0.023	0.041	0.040	0.036	0.025	0.046	0.039	0.027	0.037	0.043
Mg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cations	**2.002**	**2.004**	**2.001**	**2.000**	**2.000**	**2.002**	**2.003**	**1.993**	**1.995**	**2.004**	**1.994**	**1.995**
lueshite	0.00	0.00	-0.05	0.01	-0.06	0.01	-0.06	0.01	0.02	-0.06	-0.07	0.01
loparite	0.05	0.06	0.03	0.06	0.06	0.05	0.04	0.07	0.05	0.04	0.06	0.07
$REEFeO_3$	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.04	0.02	0.02	0.02
tausonite	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00
$REE_2Ti_2O_7$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01
lakargiite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
perovskite	0.91	0.90	0.93	0.89	0.90	0.90	0.93	0.88	0.89	0.93	0.90	0.88
Fe/Nb	**3.54**	**3.69**	**4.31**	**3.94**	**2.10**	**2.31**	**4.46**	**2.09**	**2.26**	**3.23**	**3.59**	**3.02**
ΔNNO	**-2.43**	**-2.16**	**-1.49**	**1.90**	**-2.79**	**-2.12**	**-0.12**	**-2.69**	**-0.30**	**-2.91**	**-2.27**	**-2.53**

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Supplementary Material B

Table B4. *Major element compostions of perovskite from TR-IV LM-I. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate.*

Sample	LMIC2	LMIC2	LMIC2	LMIC2	LMIC2	LMIC2	LMIC2	LMIC2	LMIC2	LMIC2	LMIC2
Grain/ Analysis	41/88	41/88	42/89	42/90	42/91	44/93	44/94	45/95	45/96	45/97	45/98
Location	C	R	C	R	R	C	R	C	R	C	R
SiO_2	0.00	0.01	0.01	0.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fe_2O_3	1.36	1.71	1.48	1.57	1.63	1.43	1.38	1.55	1.56	1.32	1.53
La_2O_3	1.16	0.91	0.87	0.90	0.90	1.46	1.22	1.78	1.71	1.54	1.67
Sm_2O_3	0.17	0.10	0.11	0.12	0.10	0.23	0.20	0.25	0.22	0.22	0.20
Pr_2O_3	0.37	0.19	0.24	0.23	0.21	0.56	0.45	0.64	0.50	0.54	0.48
CaO	36.18	38.10	37.71	36.68	38.29	34.02	35.11	33.01	33.85	34.08	34.41
Nb_2O_5	0.52	0.60	0.43	0.48	0.51	0.64	0.56	1.40	1.13	1.09	1.09
SrO	0.15	0.13	0.15	0.10	0.13	0.15	0.13	0.16	0.14	0.13	0.16
ZrO_2	0.11	0.32	0.14	0.15	0.19	0.12	0.11	0.14	0.17	0.11	0.16
ThO_2	0.16	0.00	0.00	0.00	0.00	1.13	0.43	0.37	0.03	0.36	0.01
TiO_2	54.14	54.47	54.61	53.89	55.43	53.04	53.43	52.12	52.05	53.02	52.61
BaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ce_2O_3	3.29	1.95	2.00	2.16	1.98	4.64	3.82	5.30	4.58	4.53	4.43
Nd_2O_3	1.45	0.75	0.81	0.85	0.74	2.12	1.72	2.27	1.82	1.91	1.79
Na_2O	0.67	0.40	0.39	0.44	0.40	0.98	0.81	1.08	1.01	1.06	0.99
MgO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Al_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ta_2O_5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**99.73**	**99.63**	**98.96**	**98.13**	**100.51**	**100.54**	**99.38**	**100.08**	**98.77**	**99.91**	**99.52**
Si	0.000	0.000	0.000	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.024	0.030	0.026	0.028	0.028	0.026	0.025	0.028	0.028	0.024	0.028
La	0.010	0.008	0.008	0.008	0.008	0.013	0.011	0.016	0.015	0.014	0.015
Sm	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002
Pr	0.003	0.002	0.002	0.002	0.002	0.005	0.004	0.006	0.004	0.005	0.004
Ca	0.917	0.954	0.950	0.930	0.949	0.874	0.900	0.855	0.880	0.875	0.886
Nb	0.006	0.006	0.005	0.005	0.005	0.007	0.006	0.015	0.012	0.012	0.012
Sr	0.002	0.002	0.002	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Zr	0.001	0.004	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.001	0.002
Th	0.001	0.000	0.000	0.000	0.000	0.006	0.002	0.002	0.000	0.002	0.000
Ti	0.964	0.958	0.966	0.959	0.965	0.956	0.962	0.947	0.950	0.956	0.951
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ce	0.029	0.017	0.017	0.019	0.017	0.041	0.033	0.047	0.041	0.040	0.039
Nd	0.012	0.006	0.007	0.007	0.006	0.018	0.015	0.020	0.016	0.016	0.015
Na	0.031	0.018	0.018	0.020	0.018	0.045	0.038	0.051	0.047	0.049	0.046
Mg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cations	**2.001**	**2.006**	**2.004**	**1.996**	**2.003**	**1.996**	**2.000**	**1.992**	**2.000**	**1.998**	**2.001**
lueshite	0.01	-0.07	0.00	-0.07	-0.08	0.01	-0.08	0.02	-0.08	0.01	-0.09
loparite	0.05	0.02	0.03	0.03	0.03	0.08	0.06	0.07	0.07	0.08	0.07
$REEFeO_3$	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.03
tausonite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$REE_2Ti_2O_7$	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.01
lakargiite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
perovskite	0.91	0.94	0.94	0.94	0.94	0.88	0.90	0.87	0.88	0.88	0.88
Fe/Nb	**4.30**	**4.72**	**5.69**	**5.44**	**5.35**	**3.71**	**4.11**	**1.84**	**2.30**	**2.02**	**2.34**
ΔNNO	**-2.17**	**-0.78**	**-1.53**	**-1.15**	**-1.07**	**-1.92**	**-2.05**	**-2.37**	**-1.93**	**-3.03**	**-2.06**

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Supplementary Material B

Table B4. *Major element compostions of perovskite from TR-IV LM-I. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate.*

Sample	LMIC2	LMIC2	LMIC2	LMIC2	LMIC2	LMIC2	LMIC2	LMIC2	LMIC2	LMIC2	LMIC2
Grain/ Analysis	46/100	46/99	47/101	47/102	48/103	48/104	49/105	49/106	50/107	50/108	51/109
Location	R	C	C	R	C	R	C	R	C	R	C
SiO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.09	0.04	0.00
Fe_2O_3	1.41	1.31	1.62	1.95	1.50	1.50	1.59	1.77	1.69	1.75	1.34
La_2O_3	0.98	1.27	1.30	1.15	1.37	1.10	1.21	0.85	1.26	0.98	1.22
Sm_2O_3	0.15	0.21	0.18	0.15	0.22	0.17	0.20	0.09	0.21	0.12	0.19
Pr_2O_3	0.31	0.48	0.43	0.30	0.49	0.37	0.46	0.18	0.49	0.27	0.45
CaO	37.06	34.54	35.37	36.39	34.94	36.73	35.07	38.22	34.38	37.20	35.65
Nb_2O_5	0.43	0.53	0.85	0.83	0.65	0.56	0.86	0.51	0.65	0.54	0.55
SrO	0.14	0.13	0.14	0.12	0.13	0.13	0.13	0.13	0.18	0.14	0.12
ZrO_2	0.12	0.09	0.17	0.34	0.15	0.16	0.19	0.31	0.27	0.26	0.14
ThO_2	0.07	0.66	0.04	0.10	0.49	0.06	0.53	0.01	0.90	0.07	0.19
TiO_2	54.98	53.52	53.08	52.98	53.40	54.61	52.76	54.40	52.37	54.02	53.92
BaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ce_2O_3	2.69	3.97	3.54	2.79	4.21	3.09	3.67	1.68	4.19	2.40	3.54
Nd_2O_3	1.15	1.85	1.48	1.06	1.85	1.31	1.68	0.63	1.88	1.00	1.59
Na_2O	0.57	0.82	0.68	0.53	0.83	0.64	0.77	0.35	0.90	0.57	0.73
MgO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Al_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ta_2O_5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**100.06**	**99.37**	**98.89**	**98.69**	**100.23**	**100.42**	**99.13**	**99.18**	**99.47**	**99.36**	**99.63**
Si	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.001	0.000
Fe	0.025	0.024	0.029	0.035	0.027	0.026	0.029	0.031	0.031	0.031	0.024
La	0.008	0.011	0.011	0.010	0.012	0.009	0.011	0.007	0.011	0.009	0.011
Sm	0.001	0.002	0.001	0.001	0.002	0.001	0.002	0.001	0.002	0.001	0.002
Pr	0.003	0.004	0.004	0.003	0.004	0.003	0.004	0.002	0.004	0.002	0.004
Ca	0.929	0.887	0.908	0.930	0.892	0.922	0.902	0.959	0.888	0.939	0.907
Nb	0.005	0.006	0.009	0.009	0.007	0.006	0.009	0.005	0.007	0.006	0.006
Sr	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.002
Zr	0.001	0.001	0.002	0.004	0.002	0.002	0.002	0.004	0.003	0.003	0.002
Th	0.000	0.004	0.000	0.001	0.003	0.000	0.003	0.000	0.005	0.000	0.001
Ti	0.968	0.965	0.956	0.951	0.957	0.963	0.953	0.959	0.949	0.957	0.964
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ce	0.023	0.035	0.031	0.024	0.037	0.027	0.032	0.014	0.037	0.021	0.031
Nd	0.010	0.016	0.013	0.009	0.016	0.011	0.014	0.005	0.016	0.008	0.013
Na	0.026	0.038	0.032	0.024	0.038	0.029	0.036	0.016	0.042	0.026	0.034
Mg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cations	**2.001**	**1.995**	**1.999**	**2.002**	**1.998**	**2.002**	**2.000**	**2.006**	**2.000**	**2.007**	**1.999**
lueshite	-0.09	0.01	0.01	-0.09	0.01	-0.09	0.01	-0.10	0.01	-0.10	0.01
loparite	0.04	0.07	0.05	0.03	0.06	0.05	0.05	0.02	0.07	0.04	0.06
$REEFeO_3$	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.02	0.02
tausonite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$REE_2Ti_2O_7$	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
lakargiite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
perovskite	0.93	0.90	0.91	0.92	0.89	0.92	0.90	0.95	0.88	0.93	0.91
Fe/Nb	**5.46**	**4.16**	**3.18**	**3.89**	**3.82**	**4.49**	**3.09**	**5.73**	**4.30**	**5.42**	**4.08**
ΔNNO	**-1.88**	**-2.28**	**-1.35**	**0.13**	**-1.66**	**-1.62**	**-1.48**	**-0.38**	**-0.73**	**-0.46**	**-2.25**

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Supplementary Material B

Table B4. *Major element compostions of perovskite from TR-IV LM-I. Structural formula calculated on the basis of 4 oxigens. C - core; R - rim; I - intermediate.*

Sample	LMIC2	LMIC2	LMIC2	LMIC2	LMIC2	LMIC2	LMIC2	LMIC2	LMIC2	LMIC2
Grain/ Analysis	51/110	52/111	52/112	53/113	53/114	54/116	54/117	54/119	55/120	57/122
Location	R	C	R	C	R	R	C	C	C	C
SiO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
Fe_2O_3	1.34	1.38	1.34	1.54	1.60	1.44	1.46	1.62	1.57	1.56
La_2O_3	1.16	1.19	1.03	1.18	1.21	1.33	1.49	1.49	1.28	1.34
Sm_2O_3	0.17	0.20	0.16	0.19	0.18	0.19	0.23	0.24	0.19	0.23
Pr_2O_3	0.39	0.42	0.34	0.39	0.39	0.44	0.48	0.57	0.40	0.51
CaO	36.28	35.77	36.55	35.63	35.56	35.52	34.53	33.63	35.62	33.81
Nb_2O_5	0.54	0.55	0.47	0.87	0.87	0.87	1.15	1.01	0.58	0.61
SrO	0.11	0.16	0.12	0.13	0.14	0.14	0.15	0.14	0.14	0.15
ZrO_2	0.13	0.12	0.13	0.17	0.18	0.15	0.17	0.11	0.12	0.12
ThO_2	0.09	0.33	0.08	0.02	0.01	0.36	0.13	0.83	0.14	0.96
TiO_2	54.51	53.62	54.78	53.36	53.18	54.29	53.42	52.03	53.54	52.57
BaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ce_2O_3	3.19	3.57	2.86	3.47	3.49	3.75	4.32	4.58	3.40	4.32
Nd_2O_3	1.42	1.62	1.29	1.49	1.44	1.66	1.83	2.11	1.46	2.01
Na_2O	0.65	0.74	0.61	0.71	0.72	0.78	0.84	0.93	0.64	0.89
MgO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Al_2O_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ta_2O_5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**99.99**	**99.68**	**99.77**	**99.15**	**98.98**	**100.92**	**100.20**	**99.31**	**99.08**	**99.14**
Si	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Fe	0.024	0.025	0.024	0.028	0.029	0.025	0.026	0.030	0.028	0.028
La	0.010	0.010	0.009	0.010	0.011	0.012	0.013	0.013	0.011	0.012
Sm	0.001	0.002	0.001	0.002	0.001	0.002	0.002	0.002	0.002	0.002
Pr	0.003	0.004	0.003	0.003	0.003	0.004	0.004	0.005	0.003	0.004
Ca	0.916	0.912	0.921	0.911	0.911	0.895	0.881	0.874	0.911	0.877
Nb	0.006	0.006	0.005	0.009	0.009	0.009	0.012	0.011	0.006	0.007
Sr	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Zr	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.001	0.001	0.001
Th	0.000	0.002	0.000	0.000	0.000	0.002	0.001	0.005	0.001	0.005
Ti	0.966	0.960	0.969	0.957	0.956	0.961	0.957	0.950	0.961	0.957
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ce	0.028	0.031	0.025	0.030	0.031	0.032	0.038	0.041	0.030	0.038
Nd	0.012	0.014	0.011	0.013	0.012	0.014	0.016	0.018	0.012	0.017
Na	0.030	0.034	0.028	0.033	0.034	0.035	0.039	0.044	0.030	0.042
Mg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cations	**1.999**	**2.003**	**1.999**	**2.000**	**2.001**	**1.995**	**1.992**	**1.995**	**1.999**	**1.995**
lueshite	-0.10	0.01	-0.11	0.01	-0.11	-0.12	0.01	0.01	0.01	0.01
loparite	0.05	0.06	0.05	0.05	0.05	0.05	0.05	0.07	0.05	0.07
$REEFeO_3$	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03
tausonite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$REE_2Ti_2O_7$	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01
lakargiite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
perovskite	0.92	0.90	0.92	0.91	0.91	0.90	0.89	0.88	0.91	0.88
Fe/Nb	**4.15**	**4.14**	**4.77**	**2.96**	**3.06**	**2.75**	**2.11**	**2.67**	**4.50**	**4.27**
ΔNNO	**-2.27**	**-2.08**	**-2.18**	**-1.76**	**-1.48**	**-2.29**	**-2.51**	**-1.49**	**-1.23**	**-1.23**

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Supplementary Material B

Table B5. *Major element compostions of ilmenite from LMI all samples. Structural formula calculated on the basis of 6 oxigens. C - core; R - rim; I - intermediate.*

Sample	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM-2	LM3-1	LM3-1	LM3-1	LM3-1
Grain/Analysis	01/01	01/02	02/03	02/04	03/05	03/06	04/07	04/08	05/09	05/10	06/11	06/12	07/13	07/14	08/15	08/16	09/17	09/18	10/19	10/20	11/21	11/22
Location	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R
SiO_2	0.02	0.02	0.05	0.00	0.01	0.02	0.02	0.03	0.02	0.06	0.02	0.04	0.01	0.03	0.02	0.03	0.02	0.03	0.00	0.03	0.02	0.02
FeO	31.17	29.87	31.54	30.48	31.70	30.87	37.03	34.46	39.73	37.85	28.63	28.45	32.01	31.44	29.90	29.62	31.95	31.17	33.83	32.08	39.09	38.56
MnO	0.39	0.44	0.32	0.43	0.34	0.45	0.47	0.59	0.45	0.56	0.71	0.72	0.44	0.51	0.80	0.78	0.38	0.43	0.58	0.69	0.46	0.51
NiO	0.21	0.21	0.19	0.22	0.22	0.20	0.08	0.10	0.07	0.07	0.16	0.15	0.16	0.16	0.15	0.13	0.20	0.18	0.14	0.11	0.09	0.10
K_2O	0.00	0.01	0.00	0.03	0.01	0.02	0.00	0.00	0.02	0.04	0.02	0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.03	0.00
CaO	0.00	0.05	0.01	0.00	0.01	0.04	0.04	0.12	0.01	0.11	0.06	0.12	0.02	0.02	0.05	0.17	0.03	0.05	0.05	0.07	0.00	0.11
Nb_2O_5	0.17	0.15	0.20	0.20	0.09	0.13	0.15	0.19	0.40	0.34	0.15	0.16	0.17	0.19	0.23	0.13	0.15	0.11	0.32	0.24	0.39	0.40
TiO_2	50.01	50.72	49.65	50.40	50.08	50.02	47.84	49.14	46.75	47.34	50.61	51.20	49.77	49.65	50.96	51.01	50.58	50.86	50.70	51.57	45.57	46.19
Cr_2O_3	4.02	3.73	4.16	4.11	3.94	3.85	1.55	1.59	1.10	1.15	3.79	4.19	4.13	4.22	3.10	3.21	3.85	3.84	1.75	1.77	2.68	2.70
ZnO	0.02	0.01	0.03	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.03	0.07	0.05	0.03	0.00	0.04	0.02	0.00	0.01	0.01	0.00	0.00
MgO	12.29	12.65	11.86	12.26	11.96	12.32	10.35	11.49	8.61	10.15	13.65	14.07	11.70	12.16	13.01	13.19	12.01	12.62	12.02	12.85	9.53	9.82
Na_2O	0.03	0.04	0.00	0.02	0.00	0.00	0.02	0.04	0.01	0.03	0.05	0.04	0.02	0.01	0.01	0.03	0.00	0.00	0.02	0.02	0.00	0.01
Total:	98.50	97.97	98.12	98.21	98.45	97.99	97.64	97.82	97.18	97.72	97.94	99.31	98.54	98.51	98.25	98.35	99.28	99.36	99.48	99.52	97.92	98.47
Al	0.009	0.005	0.005	0.003	0.004	0.004	0.005	0.004	0.000	0.001	0.003	0.005	0.003	0.003	0.001	0.001	0.006	0.003	0.003	0.004	0.003	0.003
Si	0.001	0.001	0.002	0.000	0.000	0.001	0.001	0.001	0.001	0.003	0.001	0.002	0.000	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001
Fe^{3+}	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe^{2+}	1.213	1.166	1.236	1.191	1.237	1.207	1.469	1.355	1.606	1.503	1.109	1.085	1.251	1.225	1.161	1.146	1.237	1.200	1.307	1.231	1.556	1.524
Mn	0.015	0.017	0.013	0.017	0.014	0.018	0.019	0.023	0.018	0.023	0.028	0.028	0.017	0.020	0.032	0.031	0.015	0.017	0.023	0.027	0.018	0.020
Ni	0.008	0.008	0.007	0.008	0.008	0.008	0.003	0.004	0.003	0.003	0.006	0.005	0.006	0.006	0.006	0.005	0.007	0.007	0.005	0.004	0.004	0.004
K	0.000	0.000	0.000	0.002	0.001	0.001	0.000	0.000	0.001	0.002	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000
Ca	0.000	0.003	0.001	0.000	0.001	0.002	0.002	0.006	0.000	0.006	0.003	0.006	0.001	0.001	0.002	0.009	0.001	0.003	0.003	0.003	0.000	0.005
Nb	0.004	0.003	0.005	0.005	0.002	0.003	0.004	0.005	0.010	0.008	0.003	0.004	0.004	0.005	0.006	0.003	0.004	0.003	0.008	0.006	0.010	0.010
Ti	1.751	1.781	1.750	1.772	1.758	1.759	1.708	1.738	1.700	1.691	1.764	1.756	1.749	1.740	1.780	1.776	1.761	1.762	1.762	1.780	1.632	1.642
Cr	0.148	0.138	0.154	0.152	0.145	0.142	0.058	0.059	0.042	0.043	0.139	0.151	0.153	0.155	0.114	0.117	0.141	0.140	0.064	0.064	0.101	0.101
Zn	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.002	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000
Mg	0.852	0.880	0.828	0.854	0.832	0.859	0.732	0.805	0.620	0.719	0.943	0.956	0.815	0.844	0.900	0.910	0.829	0.866	0.828	0.879	0.676	0.692
Na	0.002	0.003	0.000	0.002	0.000	0.000	0.002	0.003	0.001	0.003	0.005	0.004	0.002	0.001	0.001	0.003	0.000	0.000	0.002	0.002	0.000	0.001
Total	4.004	4.005	4.002	4.005	4.003	4.003	4.002	4.004	4.002	4.004	4.006	4.005	4.004	4.004	4.003	4.004	4.002	4.002	4.003	4.003	4.002	4.002

Supplementary Material B

Table B5. *Major element compostions of ilmenite from LMI all samples. Structural formula calculated on the basis of 6 oxigens. C - core; R - rim; I - intermediate.*

Sample	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-1	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2	LM3-2
Grain/Analysis	12/23	12/24	13/25	13/26	14/27	14/28	15/29	15/30	16/31	17/32	18/33	19/35	19/36	20/37	20/38
Location	C	R	C	R	C	R	C	R	C	C	C	C	R	C	R
SiO_2	0.01	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.00	0.00	0.02	0.03	0.04	0.00	0.02
FeO	32.04	31.29	31.02	31.54	32.29	30.09	17.78	17.83	42.81	32.24	33.38	36.72	34.95	35.63	33.33
MnO	0.55	0.62	0.36	0.37	0.36	0.55	1.70	1.70	0.34	0.39	0.57	0.52	0.56	0.37	0.56
NiO	0.16	0.13	0.21	0.21	0.22	0.17	0.07	0.08	0.10	0.23	0.11	0.12	0.12	0.15	0.12
K_2O	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.03	0.01	0.00	0.01	0.03	0.00	0.00
CaO	0.04	0.06	0.02	0.02	0.03	0.05	0.21	0.36	0.00	0.02	0.22	0.02	1.00	0.01	0.12
Nb_2O_5	0.16	0.11	0.11	0.14	0.13	0.13	0.08	0.12	0.56	0.38	0.19	0.16	0.10	0.27	0.16
TiO_2	51.07	50.22	49.90	50.25	49.27	49.93	58.29	58.26	45.91	50.82	50.56	50.31	49.13	48.25	49.12
Cr_2O_3	3.40	3.32	4.26	4.41	4.25	5.11	0.02	0.00	1.75	4.00	1.85	1.38	1.58	3.94	3.97
ZnO	0.02	0.02	0.08	0.00	0.02	0.02	0.00	0.00	0.01	0.00	0.02	0.01	0.03	0.03	0.00
MgO	11.69	12.43	12.23	12.43	11.71	12.61	20.54	20.30	7.45	11.95	12.02	10.31	11.03	10.36	11.73
Na_2O	0.04	0.05	0.00	0.01	0.00	0.06	0.05	0.00	0.02	0.02	0.02	0.02	0.02	0.00	0.00
Total:	99.25	98.34	98.30	99.48	98.34	98.89	98.77	98.67	99.02	100.15	99.06	99.66	98.65	99.06	99.20
Al	0.004	0.003	0.005	0.003	0.002	0.008	0.000	0.000	0.002	0.005	0.006	0.003	0.003	0.003	0.003
Si	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.001	0.002	0.000	0.001
Fe^{3+}	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe^{2+}	1.244	1.218	1.210	1.215	1.263	1.164	0.652	0.656	1.714	1.240	1.293	1.433	1.364	1.398	1.292
Mn	0.022	0.025	0.014	0.014	0.014	0.022	0.063	0.063	0.014	0.015	0.022	0.021	0.022	0.015	0.022
Ni	0.006	0.005	0.008	0.008	0.008	0.006	0.002	0.003	0.004	0.009	0.004	0.004	0.004	0.006	0.004
K	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.002	0.001	0.000	0.001	0.002	0.000	0.000
Ca	0.002	0.003	0.001	0.001	0.001	0.002	0.010	0.017	0.000	0.001	0.011	0.001	0.050	0.000	0.006
Nb	0.004	0.003	0.003	0.003	0.003	0.003	0.002	0.003	0.014	0.009	0.005	0.004	0.002	0.007	0.004
Ti	1.784	1.758	1.751	1.742	1.734	1.737	1.924	1.927	1.654	1.759	1.761	1.766	1.725	1.702	1.713
Cr	0.125	0.122	0.157	0.161	0.157	0.187	0.001	0.000	0.066	0.145	0.068	0.051	0.058	0.146	0.145
Zn	0.001	0.001	0.003	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.000
Mg	0.809	0.862	0.850	0.854	0.817	0.869	1.344	1.331	0.532	0.819	0.830	0.717	0.767	0.724	0.811
Na	0.003	0.005	0.000	0.001	0.000	0.006	0.004	0.000	0.002	0.002	0.002	0.002	0.002	0.000	0.000
Total	4.004	4.005	4.003	4.003	4.003	4.006	4.004	4.001	4.004	4.005	4.003	4.004	4.004	4.002	4.001

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Supplementary Material B

Table B6. Major element compostions of clinopyroxene from TR-IV and LM-I.

Structural formula calculated on the basis of 6 oxigens, following Morimoto (1988).
C - core; R - rim; I - intermediated; mt - matrix; mega - megacryst

Sample	TR-02A	TR-02A	TR-02A	TR-07	TR-07	TR-07	TR-07	TR-07	TR-07	LMI-B2
Grain/Analysis	01/01	02/03	03/04	04/05	04/06	05/07	11/13	12/16	13/17	01/01
Location	C	C	C	C	R	C	C	R	C	C
Crystal type	mt	mt	mt	mt	mt	mt	mt	mt	mt	mega
SiO_2	51.72	51.76	51.76	52.92	51.30	51.25	51.01	52.09	53.34	52.73
TiO_2	0.93	0.63	0.63	0.73	0.79	1.98	2.12	0.85	0.57	0.32
Al_2O_3	0.13	0.16	0.16	0.13	0.15	0.41	0.31	0.09	0.09	0.10
FeO	4.86	3.27	3.27	4.77	3.00	4.51	4.33	3.49	3.49	3.22
MnO	0.11	0.07	0.07	0.13	0.07	0.11	0.08	0.15	0.15	0.09
MgO	15.47	16.81	16.81	15.84	17.45	15.63	15.54	16.45	16.45	20.80
CaO	22.91	24.10	24.10	23.58	24.88	23.02	22.67	23.76	23.76	21.87
Na_2O	1.34	0.87	0.87	1.01	0.67	1.31	1.35	0.93	0.93	0.57
K_2O	0.01	0.00	0.00	0.01	0.02	0.00	0.01	0.03	0.03	0.21
Cr_2O_3	0.44	0.16	0.16	0.10	0.03	0.23	0.28	0.39	0.39	0.10
Total	**97.91**	**97.83**	**97.83**	**99.22**	**98.36**	**98.45**	**97.69**	**98.23**	**99.20**	**100.00**
Si (T)	1.928	1.919	1.919	1.948	1.889	1.902	1.908	1.929	1.956	1.887
Al (T)	0.006	0.007	0.007	0.005	0.007	0.018	0.014	0.004	0.004	0.004
Fe3 (T)	0.066	0.074	0.074	0.046	0.092	0.080	0.079	0.067	0.040	0.096
Σ (T)	**2.000**	**2.000**	**2.000**	**2.000**	**1.988**	**2.000**	**2.000**	**2.000**	**2.000**	**1.988**
Al (M1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ti (M1)	0.026	0.018	0.018	0.020	0.022	0.055	0.060	0.024	0.016	0.009
Fe3+ (M1)	0.085	0.027	0.027	0.081	0.000	0.060	0.057	0.041	0.067	0.000
Cr (M1)	0.013	0.005	0.005	0.003	0.001	0.007	0.008	0.012	0.011	0.003
Mg (M1)	0.860	0.929	0.929	0.870	0.957	0.865	0.866	0.908	0.899	0.989
Fe2+ (M1)	0.000	0.000	0.000	0.019	0.000	0.000	0.000	0.000	0.000	0.000
Mn (M1)	0.004	0.002	0.002	0.004	0.002	0.003	0.002	0.005	0.005	0.000
Σ (M1)	**0.988**	**0.980**	**0.980**	**0.997**	**0.982**	**0.991**	**0.993**	**0.989**	**0.999**	**1.000**
Mg (M2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.121
Fe2+ (M2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mn (M2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
Ca (M2)	0.915	0.957	0.957	0.930	0.981	0.915	0.908	0.943	0.934	0.839
Na (M2)	0.097	0.062	0.062	0.072	0.048	0.094	0.098	0.067	0.066	0.040
K (M2)	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.001	0.010
Σ (M2)	**1.012**	**1.020**	**1.020**	**1.003**	**1.030**	**1.009**	**1.007**	**1.011**	**1.001**	**1.012**
Cations	**4.000**	**4.000**	**4.000**	**4.000**	**4.000**	**4.000**	**4.000**	**4.000**	**4.000**	**4.000**
Sum	90.54	93.90	93.90	92.19	94.27	89.60	89.60	93.16	93.56	94.75
Xen	0.51	0.51	0.51	0.50	0.51	0.51	0.52	0.51	0.50	0.59
Xwo	0.49	0.49	0.49	0.49	0.49	0.48	0.48	0.49	0.49	0.41
Xfs	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00

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Supplementary Material B

Table B6. Major element compostions of clinopyroxene from TR-IV and LM-I.

Structural formula calculated on the basis of 6 oxigens, following Morimoto (1988).
C - core; R - rim; I - intermediated; mt - matrix; mega - megacryst

Sample	LMI-B2	LMI-B2	LMI-A1	LMI-A1	LMI-A1	LMI-A1	LMI-A1
Grain/Analysis	01/02	01/04	02/05	02/06	02/07	02/08	02/09
Location	R	R	C	R	R	C	C
Crystal type	mega	mega	mega	macro	macro	macro	macro
SiO_2	53.21	50.56	54.31	54.29	54.29	54.07	53.90
TiO_2	0.36	0.26	0.15	0.14	0.23	0.18	0.21
Al_2O_3	0.05	0.35	0.21	0.23	0.32	0.21	0.19
FeO	2.78	4.17	3.09	3.19	3.36	3.16	3.09
MnO	0.07	0.13	0.12	0.10	0.12	0.12	0.11
MgO	18.59	24.02	17.60	17.43	17.54	17.57	17.55
CaO	23.79	19.30	22.66	22.92	22.16	23.01	23.07
Na_2O	0.62	0.40	0.81	0.79	0.79	0.81	0.81
K_2O	0.10	0.14	0.00	0.00	0.01	0.01	0.03
Cr_2O_3	0.16	0.13	0.88	0.92	1.02	0.97	1.08
Total	**99.72**	**99.44**	**99.82**	**100.02**	**99.85**	**100.11**	**100.02**
Si (T)	1.925	1.801	1.973	1.970	1.974	1.959	1.955
Al (T)	0.002	0.015	0.009	0.010	0.014	0.009	0.008
Fe3 (T)	0.073	0.124	0.018	0.020	0.012	0.032	0.037
Σ (T)	**2.000**	**1.940**	**2.000**	**2.000**	**2.000**	**2.000**	**2.000**
Al (M1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ti (M1)	0.010	0.007	0.004	0.004	0.006	0.005	0.006
Fe3+ (M1)	0.011	0.000	0.051	0.051	0.040	0.061	0.056
Cr (M1)	0.005	0.004	0.025	0.027	0.029	0.028	0.031
Mg (M1)	0.975	0.989	0.920	0.919	0.924	0.907	0.907
Fe2+ (M1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mn (M1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Σ (M1)	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
Mg (M2)	0.028	0.286	0.033	0.024	0.027	0.042	0.042
Fe2+ (M2)	0.000	0.000	0.025	0.026	0.050	0.003	0.000
Mn (M2)	0.002	0.004	0.004	0.003	0.004	0.004	0.003
Ca (M2)	0.922	0.737	0.882	0.891	0.863	0.893	0.896
Na (M2)	0.043	0.027	0.057	0.055	0.056	0.057	0.057
K (M2)	0.005	0.006	0.000	0.000	0.000	0.000	0.001
Σ (M2)	**1.000**	**1.060**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
Cations	**4.000**	**4.000**	**4.000**	**4.000**	**4.000**	**4.000**	**4.000**
Sum	95.25	93.60	96.19	96.09	96.73	94.90	94.79
Xen	0.53	0.66	0.52	0.51	0.51	0.52	0.52
Xwo	0.47	0.33	0.47	0.47	0.46	0.47	0.47
Xfs	0.00	0.00	0.02	0.02	0.03	0.00	0.00

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Supplementary Material B

Table B7. Major element compostions of garnet from TR-IV . Structural formula calculated on the basis of 8 cations and 12 anions. Endmembers calculated following Locock, (2008). C - core; R - rim; I - intermediate.

Sample	TR-04A	TR-04A	TR-04A	TR-04A	TR-04A	TR-04B	TR-04B	TR-04B	TR-04B	TR-04B	TR-04B	TR-04B	TR-04B	TR-04B	TR-07 241	TR-07 241
Grain/Analysis	01/01	01/02	01/03	02/04	02/06	03/07	03/08	03/09	04/10	04/11	04/12	05/13	05/14	05/15	06/16	07/17
Location	C	I	R	C	R	C	I	R	C	I	R	C	I	R	C	C
SiO_2	42.06	42.19	41.58	42.08	42.56	42.52	42.54	42.17	42.44	42.68	42.25	42.53	42.17	42.74	41.91	41.51
TiO_2	0.22	0.21	0.22	0.26	0.12	0.06	0.09	0.05	0.23	0.20	0.20	0.02	0.08	0.05	0.03	0.08
Al_2O_3	20.94	21.14	20.65	22.87	23.03	20.63	20.72	20.58	22.20	22.38	22.32	20.59	20.55	20.66	21.24	21.08
Cr_2O_3	2.90	2.78	3.31	0.91	0.67	4.25	4.02	4.30	1.49	1.34	1.37	4.26	4.34	4.39	2.86	2.95
FeO_T	9.22	9.44	8.99	9.38	9.20	7.49	7.34	7.63	9.56	9.44	9.74	7.62	7.48	7.55	8.79	8.42
MnO	0.40	0.39	0.41	0.35	0.32	0.39	0.37	0.43	0.42	0.42	0.36	0.38	0.37	0.43	0.42	0.41
MgO	19.38	19.34	19.15	20.26	19.43	21.19	21.04	20.07	19.62	19.68	19.71	20.71	20.81	20.55	19.97	19.78
CaO	4.81	4.82	4.81	3.99	4.05	4.41	4.66	5.16	4.59	4.50	4.59	4.72	4.68	4.80	4.78	4.76
Na_2O	0.04	0.03	0.07	0.04	0.04	0.05	0.02	0.04	0.08	0.07	0.05	0.03	0.02	0.04	0.02	0.02
Total	**99.98**	**100.33**	**99.20**	**100.14**	**99.42**	**100.99**	**100.79**	**100.42**	**100.63**	**100.70**	**100.59**	**100.86**	**100.49**	**101.22**	**100.01**	**99.01**
Si	3.000	3.000	3.000	2.988	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	2.998	3.000	2.997	2.998
Al^{IV}	0.000	0.000	0.000	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.003	0.002
ΣT	**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**	**3.000**
Si	0.021	0.021	0.013	0.000	0.049	0.004	0.011	0.009	0.014	0.027	0.001	0.015	0.000	0.022	0.000	0.000
Ti	0.012	0.011	0.012	0.014	0.006	0.003	0.005	0.003	0.012	0.011	0.011	0.001	0.004	0.003	0.002	0.004
Al^{VI}	1.772	1.784	1.764	1.903	1.944	1.718	1.728	1.730	1.859	1.870	1.868	1.720	1.720	1.721	1.788	1.792
Cr	0.165	0.157	0.190	0.051	0.038	0.238	0.225	0.243	0.084	0.075	0.077	0.239	0.244	0.246	0.162	0.169
Fe^{2+}	0.006	0.006	0.003	0.000	0.000	0.000	0.002	0.000	0.001	0.000	0.004	0.000	0.000	0.000	0.000	0.000
Fe^{3+}	0.002	0.000	0.006	0.034	0.000	0.037	0.019	0.009	0.015	0.000	0.038	0.013	0.032	0.000	0.052	0.034
Mg	0.021	0.021	0.013	0.000	0.000	0.001	0.011	0.006	0.014	0.017	0.001	0.012	0.000	0.008	0.000	0.000
ΣA	**2.000**	**2.000**	**2.000**	**2.002**	**2.038**	**2.000**	**2.000**	**2.000**	**2.000**	**2.000**	**2.000**	**2.000**	**2.000**	**2.000**	**2.003**	**2.000**
Fe^{2+}	0.545	0.560	0.536	0.523	0.551	0.406	0.413	0.446	0.551	0.560	0.536	0.439	0.413	0.446	0.474	0.474
Mg	2.054	2.043	2.056	2.145	2.075	2.231	2.209	2.129	2.064	2.063	2.086	2.176	2.205	2.158	2.129	2.130
Mn	0.025	0.023	0.025	0.021	0.020	0.023	0.022	0.026	0.025	0.025	0.022	0.023	0.022	0.026	0.026	0.025
Ca	0.370	0.370	0.374	0.304	0.311	0.334	0.353	0.394	0.349	0.342	0.350	0.359	0.356	0.364	0.366	0.368
Na	0.006	0.004	0.009	0.005	0.006	0.007	0.003	0.005	0.011	0.010	0.006	0.004	0.003	0.006	0.002	0.002
ΣB	**3.000**	**3.000**	**3.000**	**2.998**	**2.962**	**3.000**	**3.000**	**3.000**	**3.000**	**3.000**	**3.000**	**3.000**	**3.000**	**3.000**	**2.997**	**3.000**
Uvarovite	0.08	0.08	0.09	0.03	0.02	0.11	0.11	0.12	0.04	0.04	0.04	0.12	0.12	0.12	0.08	0.08
Spessartine	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Pyrope	**0.66**	**0.66**	**0.67**	**0.72**	**0.69**	**0.73**	**0.73**	**0.70**	**0.67**	**0.67**	**0.69**	**0.71**	**0.73**	**0.71**	**0.71**	**0.71**
Almandine	0.18	0.19	0.18	0.17	0.18	0.12	0.13	0.15	0.18	0.19	0.18	0.14	0.12	0.14	0.16	0.16
Grossular	0.03	0.04	0.02	0.06	0.08	0.00	0.00	0.00	0.06	0.07	0.05	0.00	0.00	0.00	0.02	0.02
Andradite	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.02	0.02

Supplementary Material B

Table B7. Major element compostions of garnet from TR-IV . Structural formula calculated on the basis of 8 cations and 12 anions. Endmembers calculated following Locock, (2008). C - core; R - rim; I - intermediate.

Sample	TR-07 241	TR-07 241	TR-07 241	TR-07 241	TRIV-5-2	TRIV-5-2	TRIV-5-2	TRIV-5-2
Grain/Analysis	07/18	07/18	08/19	08/20	09/21	09/22	10/23	11/24
Location	R	R	C	R	C	R	C	R
SiO_2	43.23	43.23	41.94	41.79	40.70	40.99	40.72	40.68
TiO_2	0.09	0.09	0.05	0.06	0.13	0.04	0.10	0.06
Al_2O_3	21.80	21.80	21.30	21.23	17.98	18.11	18.12	18.06
Cr_2O_3	2.92	2.92	3.01	2.91	6.94	6.97	7.04	7.20
FeO_T	8.61	8.61	8.76	8.60	7.81	7.93	8.15	8.05
MnO	0.40	0.40	0.47	0.49	0.43	0.46	0.44	0.45
MgO	18.83	18.83	20.06	20.47	19.08	18.97	18.91	18.86
CaO	4.86	4.86	4.69	4.68	5.67	5.67	5.57	5.58
Na_2O	0.01	0.01	0.02	0.01	0.00	0.00	0.00	0.00
Total	**100.75**	**100.75**	**100.30**	**100.22**	**98.75**	**99.15**	**99.06**	**98.94**
Si	3.000	3.000	2.992	2.977	2.990	3.000	2.987	2.988
Al^{IV}	0.000	0.000	0.008	0.023	0.010	0.000	0.013	0.012
ΣT	**3.000**	**3.000**	**3.000**	**3.000**	**3.000**	**3.000**	**3.000**	**3.000**
Si	0.084	0.084	0.000	0.000	0.000	0.001	0.000	0.000
Ti	0.005	0.005	0.003	0.003	0.007	0.002	0.006	0.003
Al^{VI}	1.833	1.833	1.782	1.760	1.547	1.563	1.553	1.552
Cr	0.165	0.165	0.170	0.164	0.403	0.404	0.408	0.418
Fe^{2+}	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000
Fe^{3+}	0.000	0.000	0.054	0.093	0.045	0.026	0.040	0.035
Mg	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
ΣA	**2.087**	**2.087**	**2.009**	**2.020**	**2.003**	**2.000**	**2.007**	**2.008**
Fe^{2+}	0.514	0.514	0.468	0.419	0.434	0.457	0.460	0.459
Mg	2.003	2.003	2.133	2.174	2.090	2.069	2.068	2.065
Mn	0.024	0.024	0.028	0.029	0.027	0.029	0.027	0.028
Ca	0.371	0.371	0.359	0.357	0.446	0.445	0.438	0.439
Na	0.001	0.001	0.003	0.001	0.000	0.000	0.000	0.000
ΣB	**2.913**	**2.913**	**2.991**	**2.980**	**2.997**	**3.000**	**2.993**	**2.992**
Uvarovite	0.08	0.08	0.08	0.08	0.15	0.15	0.14	0.14
Spessartine	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Pyrope	**0.67**	**0.67**	**0.71**	**0.72**	**0.64**	**0.63**	**0.63**	**0.62**
Almandine	0.17	0.17	0.16	0.14	0.12	0.14	0.14	0.14
Grossular	0.04	0.04	0.01	0.01	0.00	0.00	0.00	0.00
Andradite	0.00	0.00	0.02	0.03	0.00	0.00	0.00	0.00

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OXYGEN FUGACITY OF THE ALTO PARANAÍBA KIMBERLITES AND DIAMOND INSTABILITY: TRÊS RANCHOS IV AND LIMEIRA I INTRUSIONS
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