

Table S2. Probe data - nonsilicates

Sample Classification

Type I spinel lherzolites and hazrzburchites	Type I Websterite	Type II clinopyroxenites	Type II olivine clinopyroxenites	Type II amphibole clinopyroxenites ± olivine	Type II Wehrlite	Type II/II composite	Type II/I composite	Type I/I composite
pk-G-20-1 Type Ib	pk-G-23B-5	pk-G-21-3	pk-G-20-8	pk-G-22-1	pk-G-20-5	pk-G-20-11	pk-G-20-10a,b	pk-G-21-6
pk-G-20-12a Type Ib	82-4-5	22 MD	pk-G-21-2	pk-G-22-2	pk-G-20-6	pk-G-20-13	pk-G-22-16	pk-G-20-9
pk-G-20-12b Type Ib	82-4-6	90-22-1	pk-G-21-4	pk-G-22-3	pk-G-21-1	pk-G-21-7		pk-G-23B-3
pk-G-20-12c Type Ib		90-22-3	pk-G-21-10	pk-G-22-4	pk-G-54	pk-G-21-8a,b		
pk-G-20-2		90-30	pk-G-21-13	pk-G-22-7		pk-G-21-9		
20-7lherzType Ia		90-45-5	pk-G-23B-7	PK-G-22-8				
pk-G-21-12		90-47-1	90-6-1	pk-G-22-9				
pk-G-21-5		90-47-2		pk-G-22-10				
pk-G-23B-1		90-47-3		pk-G-22-11				
pk-G-23B-2 Type Ia		90-47-6		pk-G-22-12				
pk-G-23B-4 Type Ia				pk-G-22-13				
24 MD				pk-G-22-14				
723 MD				pk-G-22-15				
pk-G-ZH1 Type Ia				90-37				
pk-G-ZH5 Type Ib				90-37-2				

Spinel from Type I perioditites

Cr spinel in Type I spinel herzolites and pyroxenites

Data collected on SMU JEOL microprobe (Unpublished data from Kempton

Data collected Univ Colorado Boulder (July 2017)

Data collected Univ Colorado Boulder (June 2021)

	pk-G- 20-1		pk-G-20-2				pk-G-20-7		pk-G-20-8	
	(1)	(2)	(23)	(15)	(21)	(8)	(1)	(2)	(13)	(10)
SiO ₂	0.04	0.04	0.04	0.04	0.05	0.03	0.04	0.04	0.03	0.03
TiO ₂	0.10	0.10	0.13	0.12	0.13	0.11	0.10	0.11	0.08	0.07
Al ₂ O ₃	51.18	51.10	58.06	59.11	58.64	58.72	57.75	57.75	40.81	40.94
V ₂ O ₅	nd	nd	0.14	0.14	0.14	0.13	nd	nd	0.19	0.20
Cr ₂ O ₃	17.03	17.11	8.16	7.46	7.65	7.68	9.00	9.14	27.48	27.18
FeO _{Tot}	10.05	10.26	9.34	9.28	9.35	9.27	10.62	10.52	12.00	12.09
MnO	0.15	0.16	0.08	0.10	0.11	0.11	0.12	0.12	0.18	0.18
MgO	20.97	20.81	21.79	22.05	22.00	21.95	21.26	21.27	19.09	19.11
Total	99.38	99.44	97.57	98.14	97.89	97.86	98.75	98.80	99.75	99.70
FeO	7.66	8.04	7.14	7.10	7.16	6.83	8.13	8.27	9.28	9.19
Fe ₂ O ₃	2.65	2.47	2.44	2.42	2.43	2.72	2.77	2.50	3.02	3.22
Total	99.78	99.83	97.98	98.54	98.31	98.28	99.17	99.20	100.16	100.12
Cr#	0.182	0.183	0.086	0.078	0.080	0.081	0.095	0.096	0.311	0.308

Spinel from Type I perioditites

Cr spinel in Ty (1984)

lherzolites and

	pk-G-20-12a			pk-G-20-12b				pk-G-20-12c				pk-G-
	(8)	(1)	(2)	(7)	(15)			(1)	(13)	(5)	(3)	
SiO ₂	0.03	0.05	0.07	0.02	0.02	0.05	0.05	0.02	0.02	0.02	0.03	0.04
TiO ₂	0.07	0.09	0.08	0.05	0.06	0.10	0.11	0.05	0.06	0.07	0.05	0.00
Al ₂ O ₃	41.12	41.05	41.20	40.81	40.75	41.14	41.05	40.34	40.18	40.37	40.40	46.52
V ₂ O ₅	0.18	nd	nd	0.19	0.18	nd	nd	0.22	0.23	0.26	0.23	nd
Cr ₂ O ₃	27.10	27.36	26.95	27.65	27.63	28.04	27.94	27.73	28.00	27.96	28.06	21.78
FeO _{Tot}	11.71	11.71	12.10	11.55	11.86	11.44	11.42	12.23	11.82	12.08	12.01	11.13
MnO	0.16	0.19	0.18	0.17	0.19	0.16	0.18	0.12	0.12	0.14	0.11	0.08
MgO	19.53	19.30	19.38	19.36	19.25	19.55	19.43	18.93	19.08	18.98	18.78	19.48
Total	99.80	99.61	99.81	99.73	99.86	100.33	100.02	99.57	99.43	99.79	99.59	98.99
FeO	8.70	8.71	8.82	8.720	8.787	8.46	8.65	9.40	9.16	9.29	9.68	9.151
Fe ₂ O ₃	3.34	3.33	3.65	3.145	3.415	3.31	3.08	3.15	2.96	3.11	2.59	2.200
Total	100.23	100.08	100.33	100.12	100.28	100.81	100.49	99.96	99.81	100.20	99.93	99.25
Cr#	0.307	0.309	0.305	0.312	0.313	0.314	0.313	0.316	0.319	0.317	0.318	0.239

Spinel from Type I perioditites

Cr spinel in Ty
herzolites and

	23B-1	pk-G-23B-2		pk-G-23B-4		pk-G-23B-5		ZH1		ZH
		(16)	(17)	(1)	(2)	(1)	(2)	(1)	(2)	(12)
SiO ₂	0.05	0.05	0.05	0.04	0.04	0.04	0.05	0.05	0.05	0.04
TiO ₂	0.03	0.00	0.00	0.08	0.10	0.12	0.13	0.11	0.13	0.13
Al ₂ O ₃	46.47	57.55	57.36	56.56	56.36	55.70	56.10	53.02	52.82	46.05
V ₂ O ₅	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Cr ₂ O ₃	22.00	9.84	10.00	10.60	10.36	11.36	11.26	13.63	13.52	20.88
FeO _{Tot}	10.95	9.95	10.05	9.79	9.76	10.33	9.82	10.53	10.61	12.31
MnO	0.11	0.06	0.05	0.12	0.12	0.13	0.11	0.13	0.13	0.14
MgO	19.43	21.46	21.35	21.39	21.39	21.18	21.33	21.33	21.25	19.33
Total	98.96	98.86	98.81	98.46	97.99	98.70	98.62	98.64	98.33	98.71
FeO	9.257	7.975	7.975	7.62	7.48	8.04	7.91	7.26	7.31	9.416
Fe ₂ O ₃	1.881	2.194	2.305	2.41	2.53	2.55	2.12	3.63	3.66	3.216
Total	99.23	99.13	99.09	98.82	98.38	99.12	99.01	99.16	98.87	99.20
Cr#	0.241	0.103	0.105	0.112	0.110	0.120	0.119	0.147	0.147	0.233

Spinel from Type I perioditites

Cr spinel in Ty
lherzolites and

	5	
	(13)	
SiO ₂	0.04	
TiO ₂	0.10	
Al ₂ O ₃	46.01	
V ₂ O ₅	nd	
Cr ₂ O ₃	20.75	
FeO _{Tot}	12.34	
MnO	0.16	
MgO	19.18	
Total	98.44	
FeO	9.362	
Fe ₂ O ₃	3.309	
Total	98.91	
Cr#	0.232	

Spinel from discrete Type II pyroxenites

Spinel, FeTi oxides, Ilmenite, sulfides in Type II pyroxenites, wehrlites, and amphibole pyroxenites

Data collected on SMU JEOL microprobe

Data collected Univ Colorado Boulder (July 2017)

Data collected Univ Colorado Boulder (June 2021)

pk-G-20-5 Olivine Clinopyroxenite

	(6)	(15)	(14b)	(10)	(10)	(10)	(13)	ilmenite (14a)	ilmenite (11)			
SiO ₂	0.00	0.02	0.09	0.03	0.05	0.03	0.09	0.05	0.02	0.00	0.00	0.00
TiO ₂	0.30	0.33	0.43	0.34	0.61	0.45	0.57	52.25	52.53	0.34	0.35	0.34
Al ₂ O ₃	56.71	56.93	56.40	57.23	53.06	55.26	58.76	0.88	0.72	57.81	58.46	58.29
V ₂ O ₅	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Cr ₂ O ₃	2.88	2.75	3.22	2.41	5.36	4.12	0.91	0.48	0.38	2.00	1.95	2.31
FeO _{Tot}	23.14	23.16	23.34	23.69	25.35	24.07	20.57	36.88	36.69	22.93	23.17	23.06
MnO	0.18	0.18	0.16	0.17	0.16	0.18	0.16	0.34	0.32	0.15	0.15	0.17
MgO	15.95	15.85	15.99	16.09	14.88	15.66	17.80	9.57	9.57	15.16	15.05	14.96
NiO	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.14	0.17	0.14
CoO	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
CaO	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.07	0.02	0.02
Total	99.16	99.22	99.63	99.96	99.47	99.77	98.86	100.45	100.23	98.60	99.33	99.28
FeO	16.49	16.76	16.66	16.69	17.92	16.90	14.20	29.59	29.90	17.57	18.11	18.20
Fe ₂ O ₃	7.39	7.12	7.43	7.78	8.26	7.96	7.08	8.10	7.54	5.96	5.63	5.40
Total	99.90	99.93	100.37	100.74	100.30	100.57	99.57	101.26	100.98	99.19	99.89	99.82
Cr#	0.0329	0.0314	0.0369	0.0275	0.0635	0.0476	0.0103	0.2679	0.2615	0.0226	0.0219	0.0258

Spinel from discrete Type II pyroxenites

Spinel, Fe²⁺
wehrlites, i)

1)											
pk-G-20-5 Olivine Clinopyroxenite								pk-G-20-6 Wehrlite			pk-G-20-7 Wehrlite
								Grain (1)	Grain (1)	Grain (1)	Grain (2)
SiO ₂	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TiO ₂	0.50	0.36	0.34	0.34	0.35	0.34	0.39	0.22	0.23	0.20	0.21
Al ₂ O ₃	58.68	58.53	58.14	58.33	58.10	58.60	58.14	61.51	60.93	61.40	61.25
V ₂ O ₅	nd	nd	nd	nd	nd	nd	nd	0.09	0.10	0.09	0.08
Cr ₂ O ₃	2.34	2.33	2.19	2.22	2.29	2.28	2.31	0.89	0.90	0.90	0.62
FeO _{Tot}	22.59	23.15	22.90	22.91	22.95	23.14	22.85	19.24	19.51	19.52	19.30
MnO	0.17	0.16	0.14	0.15	0.15	0.17	0.16	0.14	0.15	0.13	0.11
MgO	15.67	15.03	15.07	15.17	15.20	14.95	15.44	16.72	16.63	16.77	16.78
NiO	0.15	0.14	0.14	0.16	0.15	0.15	0.17	0.16	0.18	0.18	0.16
CoO	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
CaO	0.02	0.02	0.04	0.04	0.02	0.02	0.02	0.01	0.02	0.02	0.01
Total	100.13	99.73	98.96	99.32	99.21	99.65	99.49	98.98	98.64	99.21	98.54
FeO	17.59	18.29	17.91	17.88	17.81	18.37	17.54	15.82	15.72	15.75	15.55
Fe ₂ O ₃	5.56	5.40	5.54	5.59	5.71	5.30	5.90	3.81	4.21	4.19	4.18
Total	100.68	100.27	99.52	99.88	99.79	100.18	100.08	99.36	99.06	99.63	98.96
Cr#	0.0261	0.0260	0.0246	0.0249	0.0258	0.0254	0.0260	0.0096	0.0098	0.0097	0.0068

Spinel from discrete Type II pyroxenites

Spinel, Fe²⁺
wehrlites, c

		G-20-6 Wehrlite		pk-G-20-6 Wehrlite		pk-G-20-8 Olivine Clinopyroxenite				pk-G_21-2 Olivine		
		Grain (2)	Grain (2)	Grain (3)	Grain (3)	(4)	(18)	(8)	(8)	(1a)	(8)	(8)
SiO ₂		0.00	0.00	0.00	0.00	0.11	0.10	0.11	0.10	0.05	0.05	0.58
TiO ₂		0.20	0.22	0.25	0.25	0.97	0.97	0.94	1.01	0.14	0.16	0.51
Al ₂ O ₃		61.37	61.13	60.76	60.49	56.35	56.57	56.35	56.36	59.11	58.53	51.11
V ₂ O ₅		0.09	0.09	0.08	0.11	nd	nd	nd	nd	nd	nd	nd
Cr ₂ O ₃		0.59	0.61	0.97	1.00	0.00	0.00	0.00	0.00	2.38	3.09	8.44
FeO _{Tot}		19.32	19.41	19.60	19.48	25.74	25.61	25.65	25.91	20.89	21.10	24.16
MnO		0.14	0.13	0.12	0.15	0.14	0.10	0.08	0.13	0.08	0.10	0.12
MgO		16.83	16.80	16.68	16.63	15.93	16.00	15.75	15.89	16.37	16.18	14.20
NiO		0.19	0.20	0.15	0.19	nd	nd	nd	nd	nd	nd	nd
CoO		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
CaO		0.01	0.00	0.01	0.01	nd	nd	nd	nd	nd	nd	nd
Total		98.75	98.60	98.62	98.29	99.24	99.35	98.88	99.40	99.02	99.21	99.12
FeO		15.50	15.47	15.69	15.58	17.19	17.11	17.26	17.24	16.0	16.4	18.3
Fe ₂ O ₃		4.24	4.37	4.35	4.33	9.50	9.45	9.32	9.63	5.4	5.2	6.6
Total		99.17	99.04	99.06	98.73	100.19	100.30	99.81	100.36	99.56	99.73	99.78
Cr#		0.0064	0.0067	0.0105	0.0110	0.0000	0.0000	0.0000	0.0000	0.0263	0.0342	0.0997

Spinel from discrete Type II pyroxenites

Spinel, Fe²⁺
wehrlites, c

e Clinopyroxenite				pk-G_21-2 Olivine Clinopyroxenite								
	incl in ol	(6)	(avg)									
SiO ₂	0.07	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TiO ₂	0.11	0.00	0.14	0.27	0.27	0.28	0.26	0.24	0.25	0.26	0.27	0.27
Al ₂ O ₃	59.50	57.59	58.98	60.46	60.28	60.36	60.53	60.41	57.95	60.30	59.96	60.16
V ₂ O ₅	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Cr ₂ O ₃	2.03	9.88	2.58	2.30	2.30	2.21	2.27	2.24	2.19	2.23	2.22	2.11
FeO _{Tot}	20.64	9.68	20.73	20.56	20.51	20.81	20.42	20.68	20.29	20.53	20.78	20.60
MnO	0.09	0.05	0.11	0.16	0.14	0.15	0.14	0.16	0.13	0.15	0.15	0.16
MgO	16.71	21.43	16.33	15.33	15.30	15.39	15.05	15.54	15.05	15.45	15.39	15.46
NiO	nd	nd	nd	0.11	0.13	0.11	0.14	0.15	0.15	0.14	0.14	0.15
CoO	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
CaO	nd	nd	nd	0.02	0.02	0.03	0.06	0.01	0.05	0.02	0.02	0.07
Total	99.15	98.68	98.92	99.21	98.94	99.33	98.89	99.43	96.05	99.07	98.95	98.99
FeO	15.4	7.9	16.0	17.90	17.82	17.84	18.15	17.58	16.87	17.61	17.62	17.47
Fe ₂ O ₃	5.8	2.0	5.3	2.97	2.99	3.31	2.53	3.44	3.80	3.24	3.52	3.47
Total	99.73	98.88	99.45	99.51	99.24	99.66	99.14	99.77	96.44	99.40	99.31	99.33
Cr#	0.0224	0.1032	0.0285	0.0248	0.0249	0.0240	0.0246	0.0243	0.0248	0.0242	0.0243	0.0230

Spinel from discrete Type II pyroxenites

Spinel, Fe²⁺
wehrlites, spinels

pk-G-21-3 Clinopyroxenite						pk-G-21-3 Clinopyroxenite					
SiO ₂	0.32	0.47	0.31	0.39	0.33	0.00	0.00	0.00	0.00	0.00	0.00
TiO ₂	0.32	0.32	0.32	0.42	0.35	0.37	0.37	0.54	0.44	0.42	0.54
Al ₂ O ₃	58.84	59.04	58.85	58.87	58.53	58.27	58.50	59.92	59.16	58.79	59.57
V ₂ O ₅	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Cr ₂ O ₃	0.15	0.15	0.15	0.15	0.15	0.13	0.15	0.14	0.14	0.13	0.15
FeO _{Tot}	26.33	26.21	26.26	24.18	25.91	24.88	24.25	22.70	23.05	23.72	21.91
MnO	0.16	0.17	0.16	0.14	0.16	0.17	0.15	0.17	0.15	0.16	0.13
MgO	13.54	13.64	13.48	15.43	14.36	15.26	15.47	15.71	16.10	15.92	16.39
NiO	0.09	0.08	0.08	0.08	0.08	0.11	0.11	0.10	0.09	0.08	0.09
CoO	0.06	0.06	0.06	0.07	0.06	nd	nd	nd	nd	nd	nd
CaO	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.01	0.00	0.02
Total	99.81	100.13	99.67	99.72	99.92	99.20	99.02	99.30	99.15	99.22	98.78
FeO						17.83	17.48	17.55	16.75	16.99	16.34
Fe ₂ O ₃						7.84	7.52	5.73	7.01	7.48	6.19
Total						99.98	99.77	99.88	99.85	99.97	99.40
Cr#	0.0017	0.0017	0.0017	0.0017	0.0017	0.0015	0.0018	0.0016	0.0016	0.0015	0.0017

Spinel from discrete Type II pyroxenites

Spinel, Fe²⁺
wehrlites, and

pk-G-21-4 Olivine Clinopyroxenite						pk-G-22-1 Amphibole Cpxenite		pk-G-22-2 Poikilitic Kaersutite		pk-G-22-3 Amphibole Clinopyroxenite	
	(1)	(3)	(3)	(3)		(6)	(3)	(1)	(7)	(10)	(13)
SiO ₂	0.02	0.04	0.05	0.07	0.05	0.06	0.07	0.07	0.07	0.09	0.09
TiO ₂	0.31	0.38	0.44	0.53	0.41	0.60	0.59	1.03	0.47	0.49	0.52
Al ₂ O ₃	62.59	61.11	60.29	60.07	60.96	57.41	57.33	56.52	59.00	59.00	58.71
V ₂ O ₅	0.20	0.20	0.18	0.20	0.20	0.23	0.23	0.25	nd	nd	nd
Cr ₂ O ₃	0.39	0.32	0.27	0.23	0.33	0.50	0.76	0.09	0.07	0.01	0.00
FeO _{Tot}	18.89	20.39	19.26	19.03	19.86	23.61	23.75	25.00	22.27	22.25	22.21
MnO	0.14	0.14	0.17	0.16	0.12	0.15	0.16	0.18	0.17	0.11	0.09
MgO	17.33	16.90	18.76	18.86	17.55	17.21	17.13	17.33	17.04	17.19	17.10
NiO	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
CoO	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
CaO	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Total	99.87	99.48	99.42	99.15	99.48	99.77	100.02	100.47	99.09	99.14	98.72
FeO	15.64	16.03	13.02	12.70	14.94	15.41	15.48	15.51	15.239	15.075	15.135
Fe ₂ O ₃	3.61	4.84	6.93	7.03	5.47	9.11	9.19	10.55	7.814	7.974	7.863
Total	100.23	99.96	100.11	99.85	100.03	100.68	100.94	101.53	99.87	99.94	99.51
Cr#	0.0042	0.0035	0.0030	0.0026	0.0036	0.0058	0.0088	0.0011	0.0008	0.0001	0.0000

Spinel from discrete Type II pyroxenites

Spinel, Fe²⁺
wehrlites, c

Pyroxenite		pk-G-22-9 Amphibole Clinopyroxenite											
(14)													
SiO ₂	0.09	0.40	0.49	0.47	0.44	0.46	0.42	0.39	0.40	0.44	0.43	0.39	
TiO ₂	0.49	0.94	0.94	0.93	0.94	0.94	0.95	0.96	0.95	0.95	0.95	0.95	
Al ₂ O ₃	58.36	56.78	56.76	56.89	56.88	56.82	56.76	56.74	56.58	56.77	57.03	56.59	
V ₂ O ₅	nd												
Cr ₂ O ₃	0.13	0.36	0.36	0.36	0.36	0.36	0.38	0.38	0.38	0.38	0.37	0.38	
FeO _{Tot}	22.89	25.83	25.91	25.82	25.90	25.76	26.22	26.61	26.35	26.48	26.29	26.18	
MnO	0.12	0.17	0.17	0.17	0.17	0.18	0.17	0.17	0.17	0.17	0.16	0.17	
MgO	17.11	15.02	14.71	14.83	15.01	14.75	14.83	14.84	15.01	15.07	14.94	14.82	
NiO	nd	0.09	0.08	0.08	0.09	0.09	0.08	0.08	0.09	0.08	0.09	0.08	
CoO	nd	0.06	0.06	0.05	0.05	0.05	0.05	0.06	0.05	0.06	0.06	0.06	
CaO	nd	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.03	0.00	
Total	99.19	99.66	99.51	99.62	99.86	99.41	99.87	100.22	99.99	100.39	100.37	99.62	
FeO	15.219												
Fe ₂ O ₃	8.525												
Total	100.04												
Cr#	0.0015	0.0042	0.0042	0.0042	0.0043	0.0043	0.0044	0.0044	0.0045	0.0045	0.0044	0.0045	

Spinel from discrete Type II pyroxenites

Spinel, Fe²⁺
wehrlites, c

		pk-G_22-11 Amphibole Clinopyroxenite			pk-G-22-13 Amphibole Clinopyroxenite				pk-G-22-13 Ar			
		(3a)	(6a)	(12)								
SiO ₂		0.09	0.06	0.07	0.48	0.48	0.47	0.47	0.04	0.00	0.01	0.02
TiO ₂		0.92	0.80	0.83	0.53	0.51	0.51	0.51	0.43	0.48	0.47	0.46
Al ₂ O ₃		56.48	56.78	56.89	60.85	60.66	60.69	60.60	60.69	60.63	60.69	60.27
V ₂ O ₅		nd	nd		nd	nd	nd	nd	nd	nd	nd	nd
Cr ₂ O ₃		0.22	0.00	0.02	0.03	0.03	0.02	0.03	0.03	0.01	0.02	0.02
FeO _{Tot}		24.47	24.54	24.30	22.52	22.68	22.59	22.63	21.73	21.65	21.64	21.67
MnO		0.20	0.18	0.16	0.15	0.15	0.14	0.15	0.15	0.15	0.15	0.13
MgO		16.59	16.61	16.54	15.69	15.63	15.63	15.61	15.75	15.89	15.81	15.86
NiO		nd	nd	nd	0.08	0.08	0.08	0.07	0.08	0.07	0.09	0.10
CoO		nd	nd	nd	0.05	0.06	0.05	0.05	nd	nd	nd	nd
CaO		nd	nd	nd	0.02	0.00	0.00	0.00	0.02	0.03	0.04	0.04
Total		98.97	98.97	98.81	100.38	100.28	100.19	100.11	98.87	98.91	98.90	98.56
FeO		15.84	15.97	16.10					17.47	17.22	17.34	17.10
Fe ₂ O ₃		9.59	9.52	9.11					4.74	4.92	4.78	5.08
Total		99.93	99.92	99.72					#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Cr#		0.0026	0.0000	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002	0.0003	0.0003

Spinel from discrete Type II pyroxenites

Spinel, Fe²⁺
wehrlites, c

Amphibole Clinopyroxenite						pk-G-22-14 Amphibole Clinopyroxenite				pk-G-23B-7 Clinopyroxenite	
										(10)	(11)
SiO ₂	0.00	0.03	0.00	0.03	0.02	0.40	0.42	0.40	0.38	0.09	0.05
TiO ₂	0.48	0.46	0.45	0.46	0.46	1.06	1.06	1.07	1.07	0.54	0.02
Al ₂ O ₃	60.54	60.24	60.66	60.47	60.47	54.46	54.65	54.26	54.58	59.09	62.71
V ₂ O ₅	nd	nd	nd	nd	nd					nd	nd
Cr ₂ O ₃	0.02	0.02	0.01	0.01	0.02	0.23	0.24	0.24	0.24	1.09	1.07
FeO _{Tot}	21.59	21.57	21.68	21.78	21.52	27.09	27.07	27.18	27.41	20.04	16.64
MnO	0.16	0.15	0.12	0.13	0.13	0.18	0.18	0.18	0.18	0.14	0.08
MgO	15.87	15.79	15.91	15.84	15.80	14.01	14.05	13.77	13.81	17.87	18.28
NiO	0.09	0.08	0.09	0.10	0.09	0.07	0.08	0.06	0.06	nd	nd
CoO	nd	nd	nd	nd	nd	0.06	0.05	0.05	0.05	nd	nd
CaO	0.05	0.03	0.05	0.02	0.04	0.01	0.00	0.01	0.00	nd	nd
Total	98.80	98.33	98.98	98.81	98.55	97.57	97.81	97.21	97.79	98.86	98.85
FeO	17.15	17.15	17.19	17.27	17.22					13.95	13.38
Fe ₂ O ₃	4.93	4.91	5.00	5.02	4.78					6.77	3.63
Total	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!					99.54	99.21
Cr#	0.0002	0.0002	0.0002	0.0001	0.0003	0.0029	0.0029	0.0029	0.0029	0.0122	0.0113

Spinel from discrete Type II pyroxenites

Spinel, Fe²⁺
wehrlites, c

pk-G-54 Wehrlite

(12)				
	Core	----->	Rim	exsolution
SiO ₂	0.05	0.05	0.04	0.18
TiO ₂	0.03	0.02	0.22	0.13
Al ₂ O ₃	61.34	60.93	59.43	59.43
V ₂ O ₅	nd	nd	nd	nd
Cr ₂ O ₃	2.21	2.16	2.14	3.66
FeO _{Tot}	16.53	16.82	17.42	17.38
MnO	0.08	0.08	0.05	0.10
MgO	18.43	18.59	19.40	17.96
NiO	nd	nd	nd	nd
CoO	nd	nd	nd	nd
CaO	nd	nd	nd	nd
Total	98.67	98.65	98.70	98.84
FeO	12.97	12.66	11.42	13.62
Fe ₂ O ₃	3.96	4.63	6.67	4.17
Total	99.07	99.11	99.37	99.26
Cr#	0.0236	0.0232	0.0236	0.0397

Spinel from Type I / Type I composite xenoliths

Cr spinels in Type I/ Type I composite xenoliths

Data collected on SMU JEOL microprobe (Unpublished data from Kempton

Data collected Univ Colorado Boulder (July 2017)

Data collected Univ Colorado Boulder (June 2021)

		pk-G-20-9a				pk-G-20-9b		pk-G-21-6		pk-G-21-7		
		Host		Vein		Host		Host				
		(9)	(8)	(15)	(1)	(2)	(3)	(14)	(15)	(17)	(18)	(19)
SiO ₂		0.05	0.05	0.05	0.05	0.04	0.04	0.07	0.07	0.04	0.03	0.05
TiO ₂		0.12	0.12	0.11	0.11	0.13	0.11	0.39	0.41	0.11	0.09	0.10
Al ₂ O ₃		56.83	56.61	56.88	57.95	56.54	56.77	36.22	36.11	58.92	59.40	54.21
V ₂ O ₅		0.17	0.15	0.14	0.14	0.16	0.18	nd	nd	0.13	0.11	0.14
Cr ₂ O ₃		9.64	9.58	9.30	8.55	9.55	9.87	28.57	28.98	7.19	7.02	12.71
FeO _{Tot}		10.39	10.20	10.24	10.06	10.30	10.17	17.30	17.06	9.77	9.86	10.47
MnO		0.10	0.09	0.09	0.10	0.09	0.10	0.22	0.21	0.12	0.11	0.13
MgO		21.58	21.48	21.44	21.75	21.24	21.50	16.68	16.51	21.36	21.41	20.73
	Total	98.71	98.11	98.09	98.55	97.88	98.59	98.99	98.87	97.49	97.91	98.39
FeO		7.66	7.61	7.53	7.46	7.98	7.75	12.01	12.29	7.75	7.85	8.32
Fe ₂ O ₃		3.03	2.88	3.01	2.89	2.58	2.69	5.88	5.30	2.24	2.24	2.38
	Total	99.18	98.57	98.55	99.00	98.31	99.01	100.04	99.88	97.86	98.26	98.77
Cr#		0.1022	0.1020	0.0988	0.0901	0.1018	0.1044	0.3460	0.3500	0.076	0.073	0.136

Spinel from Type I / Type I composite xenoliths

Cr spinels in T₍₁₉₈₄₎

23B-3

	(22)	(23)	(24)
SiO ₂	0.04	0.04	0.03
TiO ₂	0.08	0.08	0.12
Al ₂ O ₃	52.79	54.21	58.94
V ₂ O ₅	0.14	0.15	0.13
Cr ₂ O ₃	14.30	12.52	7.02
FeO _{Tot}	10.84	10.95	10.34
MnO	0.15	0.14	0.13
MgO	20.39	20.56	21.35
Total	98.61	98.53	97.91
FeO	8.67	8.58	8.23
Fe ₂ O ₃	2.41	2.63	2.35
Total	98.97	98.91	98.30
Cr#	0.154	0.134	0.074

Spinel from Type II / Type I composite xenoliths

Spinel in Type II/ Type I composite xenoliths (Cr spinel to hercynite)

Data collected on SMU JEOL microprot

Data collected Univ Colorado Boulder (

Data collected Univ Colorado Boulder (

pk-G-20-10a (traverse from spinel lherzolite to clinopyroxenite vein)

	(1)	(2)	(3)	(4)	(5)	(7)	(8)	(10)	host	host	host
SiO ₂	0.05	0.04	0.05	0.04	0.04	0.05	0.03	0.06	0.59	0.60	0.61
TiO ₂	0.10	0.13	0.13	0.12	0.12	0.09	0.10	0.12	0.11	0.11	0.11
Al ₂ O ₃	58.62	58.95	59.36	59.45	60.98	63.39	64.79	64.79	60.94	61.15	60.83
V ₂ O ₅	0.10	0.10	0.11	0.09	0.09	0.13	0.12	0.14	nd	nd	nd
Cr ₂ O ₃	7.40	6.98	6.64	6.47	4.83	1.66	0.85	0.64	6.37	6.36	6.33
FeO _{Tot}	11.13	11.05	11.02	11.27	10.17	10.14	10.34	10.99	11.29	11.36	11.16
MnO	0.13	0.13	0.13	0.12	0.14	0.08	0.06	0.11	0.11	0.10	0.10
MgO	20.96	20.91	21.10	21.17	21.85	22.24	22.02	21.98	19.46	19.50	19.44
NiO	nd	nd	nd	nd	nd	nd	nd	nd	0.37	0.38	0.38
CoO	nd	nd	nd	nd	nd	nd	nd	nd	0.04	0.04	0.05
CaO	nd	nd	nd	nd	nd	nd	nd	nd	0.00	0.00	0.01
Total	98.49	98.29	98.54	98.73	98.22	97.78	98.31	98.83	99.292	99.6115	99.0217
FeO	8.52	8.89	8.60	8.64	7.60	7.10	7.88	8.24			
Fe ₂ O ₃	2.90	2.40	2.69	2.93	2.85	3.38	2.73	3.05			
Total	98.78	98.53	98.81	99.03	98.50	98.12	98.58	99.13			
Cr#	0.0781	0.0736	0.0698	0.0680	0.0505	0.0173	0.0087	0.0066	0.0656	0.0652	0.0653

Spinel from Type II / Type I composite xenoliths

Spinel in Type I (Unpublished data from Kempton (1984)

(July 2017)

(June 2021)

	pk-G-20-10									pk-G-22-16		
	host	host	host	vein	vein	vein	vein	vein	vein	Lherzolite Host (16)	Host (17)	Selk (18)
SiO ₂	0.61	0.62	0.63	0.61	0.59	0.64	0.66	0.63	0.65	0.04	0.04	0.04
TiO ₂	0.11	0.11	0.11	0.07	0.08	0.07	0.07	0.08	0.07	0.23	0.21	0.20
Al ₂ O ₃	61.06	61.09	60.96	66.68	66.53	66.71	66.62	66.77	66.59	49.36	48.85	49.62
V ₂ O ₅	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.16	0.17	0.11
Cr ₂ O ₃	6.38	6.37	6.38	0.56	0.56	0.56	0.56	0.56	0.56	15.49	16.05	15.27
FeO _{Tot}	11.32	11.38	11.28	11.04	11.01	11.02	10.73	11.03	10.98	15.64	15.76	15.95
MnO	0.11	0.11	0.10	0.09	0.10	0.10	0.09	0.09	0.10	0.15	0.15	0.17
MgO	19.52	19.53	19.49	20.41	20.39	20.50	20.67	20.42	20.43	17.82	17.76	17.76
NiO	0.38	0.38	0.38	0.42	0.41	0.41	0.41	0.41	0.42	nd	nd	nd
CoO	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.05	nd	nd	nd
CaO	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	nd	nd	nd
Total	99.5176	99.6208	99.3677	99.9201	99.7086	100.066	99.8593	100.029	99.8594	98.89	98.99	99.12
FeO										12.24	12.43	12.53
Fe ₂ O ₃										3.78	3.70	3.80
Total										99.27	99.36	99.50
Cr#	0.0655	0.0654	0.0656	0.0056	0.0056	0.0056	0.0056	0.0056	0.0056	0.1739	0.1806	0.1711

Spinel from Type II / Type I composite xenoliths

Spinel in Type

	age
	(19)
SiO ₂	0.04
TiO ₂	0.23
Al ₂ O ₃	47.58
V ₂ O ₅	0.15
Cr ₂ O ₃	17.45
FeO _{Tot}	16.29
MnO	0.18
MgO	17.37
NiO	nd
CoO	nd
CaO	nd
Total	99.29
FeO	12.64
Fe ₂ O ₃	4.06
Total	99.70
Cr#	0.1975

Spinel from Type II / Type II composite xenoliths

Spinel in Type II/ Type II composite xenoliths

							Data collected Univ Colorado Boulder (July 2017)			
							Data collected Univ Colorado Boulder (June 2021)			
pk-G-21-7 (thin section a)					pk-G-21-7 (thin section a)		tra			
					Grain (3)	Grain (3)	Host	exsolution		
							(1)	(2)	(4)	(5)
SiO ₂	0.48	0.40	0.47	0.41	0.00	0.00	0.03	0.15	0.03	0.03
TiO ₂	0.42	0.32	0.36	0.32	0.25	0.25	0.37	0.45	0.30	0.31
Al ₂ O ₃	61.84	61.99	61.40	61.92	63.42	62.82	53.71	52.36	55.71	56.12
V ₂ O ₅	nd	nd	nd	nd	0.10	0.11	0.30	0.22	0.21	0.21
Cr ₂ O ₃	0.09	0.08	0.08	0.09	0.17	0.17	10.03	10.56	8.34	7.08
FeO _{Tot}	19.99	21.73	21.06	21.68	18.86	18.89	15.90	16.55	15.77	15.58
MnO	0.13	0.14	0.13	0.14	16.89	16.69	0.20	0.19	0.19	0.18
MgO	17.01	15.30	16.09	15.53	0.15	0.15	18.34	17.32	18.71	18.88
NiO	0.14	0.13	0.14	0.14	0.16	0.13	nd	nd	nd	nd
CoO	0.05	0.05	0.05	0.06	nd	nd	nd	nd	nd	nd
CaO	0.01	0.01	0.03	0.01	0.02	0.01	nd	nd	nd	nd
Total	100.17	100.16	99.81	100.29	100.00	99.23	98.88	97.80	99.26	98.39
FeO					16.17	16.17	12.47	13.55	12.23	11.73
Fe ₂ O ₃					2.99	3.02	3.81	3.33	3.93	4.28
Total					100.30	99.53	99.26	98.13	99.65	98.82
Cr#	0.0009	0.0009	0.0009	0.0009	0.0018	0.0018	0.1113	0.1192	0.0913	0.0780

Spinel from Type II / Type II composite xenoliths

Spinel in Type II composite xenoliths (1984)

pk-G-21-8 verse from host into vein											
	Border (12)	Vein (13)	exsolution (15)	(19)	(23)	P1	host	host	host	host	host
SiO ₂	0.03	0.02	0.02	0.03	0.00	0.46	0.50	0.44	0.45	0.52	0.49
TiO ₂	0.26	0.21	0.31	0.34	0.22	0.53	0.51	0.35	0.39	0.35	0.53
Al ₂ O ₃	58.64	61.49	60.37	59.80	60.91	58.29	51.53	52.29	52.17	52.63	52.25
V ₂ O ₅	0.21	0.16	0.18	0.20	0.17	0.19	nd	nd	nd	nd	nd
Cr ₂ O ₃	4.80	0.67	0.70	0.56	0.67	0.32	9.58	9.65	9.64	9.71	9.81
FeO _{Tot}	15.37	17.49	20.72	21.19	18.95	20.54	16.73	16.06	16.34	16.16	16.97
MnO	0.14	0.14	0.17	0.15	0.18	0.17	0.15	0.15	0.15	0.15	0.15
MgO	19.32	18.27	17.07	17.15	18.10	17.68	16.76	16.78	16.75	16.85	16.85
NiO	nd	nd	nd	nd	nd	nd	0.20	0.21	0.19	0.20	0.20
CoO	nd	nd	nd	nd	nd	nd	0.04	0.04	0.04	0.05	0.04
CaO	nd	nd	nd	nd	nd	nd	0.00	0.01	0.01	0.00	0.01
Total	98.77	98.45	99.54	99.42	99.20	98.18	96.01	95.98	96.13	96.62	97.29
FeO	11.58	13.57	15.71	15.52	13.85	12.68					
Fe ₂ O ₃	4.21	4.35	5.56	6.30	5.67	8.73					
Total	99.19	98.88	100.09	100.05	99.77	99.05					
Cr#	0.0521	0.0073	0.0077	0.0062	0.0073	0.0037	0.1109	0.1101	0.1103	0.1101	0.1119

Spinel from Type II / Type II composite xenoliths

Spinel in Type

pk-G-21-8 (thin section a)							
	host	vein	vein	vein	vein	vein	vein
SiO ₂	0.52	0.44	0.44	0.46	0.42	0.45	0.41
TiO ₂	0.35	0.47	0.31	0.46	0.31	0.47	0.31
Al ₂ O ₃	52.64	60.51	61.33	60.53	61.29	59.67	61.29
V ₂ O ₅	nd	nd	nd	nd	nd	nd	nd
Cr ₂ O ₃	9.75	0.88	0.88	0.88	0.88	0.90	0.89
FeO _{Tot}	16.27	21.85	20.89	21.71	20.96	22.04	20.80
MnO	0.15	0.15	0.15	0.15	0.14	0.14	0.15
MgO	17.03	16.05	16.07	16.05	16.07	15.82	16.31
NiO	0.20	0.14	0.13	0.14	0.14	0.14	0.14
CoO	0.05	0.04	0.05	0.06	0.05	0.05	0.05
CaO	0.01	0.02	0.01	0.02	0.01	0.02	0.02
Total	96.97	100.53	100.26	100.44	100.28	99.71	100.35
FeO							
Fe ₂ O ₃							
Total							
Cr#	0.1105	0.0096	0.0095	0.0097	0.0096	0.0100	0.0096

Sulfides

Sulfides

Data collected Univ Colorado Boulder (May 2017)

	pk-G-20-5 Type II Wehrlite								pk-G-20-8 Type II clinopyroxenite			
	(1)	(3)	(4)	(4)	(4)	(5)	(5)	(5)	(1)	(1)	(1)	(2)
	I	I	O	O	O	E	E	E	F	F	F	E
Fe	59.29	62.15	60.51	59.31	62.41	60.03	59.46	61.09	62.16	62.32	61.62	62.93
Mg	bd	0.01	0.02	bd	bd	0.01	0.01	0.01	bd	bd	bd	bd
Ti	0.01	0.07	0.02	bd	bd	0.01	bd	0.01	0.03	0.04	0.03	bd
Cr	bd	bd	0.02	0.03	0.01	0.02	bd	0.01	0.01	0.01	0.01	bd
Mn	bd	0.05	0.05	0.06	0.03	0.04	0.02	0.04	0.02	0.04	0.05	0.06
Ni	3.22	0.72	2.80	3.89	1.40	2.62	3.68	1.61	0.71	0.70	0.70	0.60
V	bd	0.01	bd	0.01	bd	0.04	0.03	0.02	bd	bd	0.03	bd
Cu	0.13	0.01	0.33	1.00	0.07	0.38	0.42	0.22	0.14	0.13	0.12	0.02
Co	0.23	0.01	0.26	0.34	0.04	0.20	0.23	0.11	0.18	0.24	0.22	0.17
S	37.12	36.82	37.04	36.60	37.16	37.17	36.62	37.36	37.69	37.99	37.41	37.18
Total	100.01	99.85	101.05	101.25	101.13	100.52	100.48	100.47	100.94	101.48	100.21	100.96

Sulfides

Sulfides

		pk-G-20-11 Type II / Type II composite xenolith										
	(2)	(8)	(8)	(8)	(9)	(9)	(9)	(6)	(6)	(6)	(1)	(1)
	E	E	E	E	O	O	O	I	I	I	n/d	n/d
Fe	62.84	58.71	58.08	58.26	60.26	59.77	60.11	57.49	57.62	57.23	59.88	59.70
Mg	0.01	bd	bd	bd	bd	0.01	bd	bd	bd	bd	bd	bd
Ti	0.02	0.01	0.01	0.03	bd	0.02	bd	bd	bd	bd	bd	bd
Cr	bd	bd	bd	0.01	0.02	0.03	bd	0.01	0.01	0.02	bd	bd
Mn	0.06	0.02	0.00	0.00	0.05	0.07	0.05	0.01	0.03	0.03	0.03	0.05
Ni	0.62	3.64	3.81	3.69	2.84	2.63	2.77	4.15	4.15	4.32	3.16	3.21
V	bd	bd	bd	bd	bd	bd	0.04	bd	0.01	bd	0.02	bd
Cu	0.13	0.10	0.18	0.20	0.15	0.50	0.12	0.03	0.02	bd	0.15	0.18
Co	0.18	0.23	0.23	0.31	0.30	0.22	0.30	0.30	0.26	0.26	0.28	0.26
S	37.09	38.24	38.58	38.00	37.42	37.43	37.56	38.61	38.53	38.96	37.46	37.37
Total	100.94	100.95	100.90	100.51	101.05	100.69	100.96	100.60	100.62	100.81	100.99	100.78

Sulfides

Sulfides

		pk-G-21-3 coarse-grain clinopyroxenite										
	(1)	(1.1)	(2.1)	(2.2)	(4)	(6.1)	(1)	(1)	(1)	(1)	(3)	(3)
	n/d	n/d	n/d	n/d	n/d	n/d	O	O	O	O	n/d	n/d
Fe	59.88	57.09	57.01	57.28	56.16	43.64	61.09	61.52	60.57	62.09	61.22	62.68
Mg	bd	nd	nd	nd	nd	nd	bd	bd	bd	bd	0.01	0.02
Ti	bd	nd	nd	nd	nd	nd	bd	bd	bd	0.02	bd	0.01
Cr	bd	nd	nd	nd	nd	nd	bd	bd	bd	bd	0.01	0.02
Mn	0.03	nd	nd	nd	nd	nd	0.08	0.08	0.09	0.08	0.06	0.10
Ni	2.91	1.50	1.93	1.70	2.38	bd	3.24	2.67	2.55	2.06	1.41	1.07
V	0.02	nd	nd	nd	nd	nd	bd	0.01	bd	0.02	0.01	0.01
Cu	0.06	0.44	0.49	0.42	0.09	bd	0.13	0.12	0.59	0.29	0.16	0.30
Co	0.27	nd	nd	nd	nd	nd	0.35	0.18	0.38	0.17	0.19	0.23
S	37.39	37.76	38.07	37.88	37.93	56.16	36.36	35.92	36.54	36.59	37.36	36.34
Total	100.55	96.78	97.49	97.28	96.57	99.80	101.25	100.49	100.71	101.33	100.43	100.79

Sulfides

Sulfides

				pk-G-21-7 (thin section a) Type II / Type II compoite								
	(4)	(4)	(4)	(6)	(1)	(1)	(4)	(4)	(7)	(7)	(7)	(1.1)
	O	O	O	n/d	E	E	I	I	O	O	O	n/d
Fe	63.19	62.09	63.69	59.46	56.60	60.79	61.95	56.66	63.73	61.54	61.56	58.21
Mg	bd	bd	bd	bd	bd	0.01	bd	bd	bd	bd	bd	nd
Ti	0.01	0.01	0.04	0.03	0.01	0.02	bd	0.01	0.03	0.02	0.01	nd
Cr	0.01	bd	0.03	0.02	bd	0.01	bd	0.01	bd	bd	0.01	nd
Mn	0.08	0.12	0.11	0.10	0.03	0.05	0.07	0.07	0.06	0.03	0.04	nd
Ni	0.94	1.72	0.71	3.45	7.23	2.65	1.68	6.98	0.44	2.28	2.40	3.06
V	bd	bd	bd	bd	0.01	0.01	bd	0.03	0.01	bd	bd	nd
Cu	0.27	0.61	0.15	0.16	0.14	0.13	0.32	1.61	0.12	0.38	0.50	0.74
Co	0.20	0.19	0.16	0.27	0.78	0.28	0.15	0.45	0.06	0.24	0.29	nd
S	36.11	36.03	36.47	35.72	35.82	35.84	36.00	35.11	35.58	35.27	35.21	36.97
Total	100.82	100.77	101.35	99.20	100.62	99.78	100.19	100.92	100.02	99.74	100.02	98.99

Sulfides

Sulfides

					pk-G-21-8 (thin section a) Type II / Type II composite							
	(1.2)	(1.3)	(2.1)	(5)	(1.2)	(2.1)	(3.1)	(2)	nd	(1)	(1)	(1)
	n/d	n/d	n/d	n/d	n/d	n/d	n/d	F	F	O	O	O
Fe	59.49	54.69	59.25	57.20	53.46	35.85	32.23	41.65	49.56	62.82	61.83	63.86
Mg	nd	nd	nd	nd	nd	nd	nd	nd	nd	bd	0.01	bd
Ti	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.02	bd	0.01
Cr	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.01	0.01	0.01
Mn	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.08	0.08	0.09
Ni	2.32	6.96	2.52	2.56	7.16	25.58	25.18	18.90	9.26	1.83	2.02	0.56
V	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.01	bd	0.01
Cu	0.26	0.52	0.38	0.27	0.37	0.32	5.67	0.41	0.39	0.21	0.70	0.07
Co	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.21	0.21	0.11
S	37.12	36.02	36.72	38.04	35.87	35.17	34.58	35.56	38.40	36.19	36.32	36.24
Total	99.18	98.20	98.87	98.06	96.86	96.92	97.65	96.52	97.61	101.37	101.19	100.98

Sulfides

Sulfides

	pk-G-21-8 (thin section b) Type II / Type II composite										pk-G-22-9 Type II ar clinopyroxeni	
	(6)	(6)	(1)	(1)	(1)	(7)	(7)	(3)	(3)	(3.1)	(1)	(3.1)
	I	I	I	I	I	E	E	O	O	I	O	n/d
Fe	59.11	41.93	60.13	61.33	54.87	58.60	58.60	61.95	62.70	62.47	60.69	58.51
Mg	0.03	0.01	0.00	0.02	bd	0.01	0.01	0.01	bd	bd	0.02	nd
Ti	0.02	0.02	0.01	0.01	0.01	0.03	0.04	0.00	0.03	0.02	bd	nd
Cr	bd	0.02	bd	bd	0.01	bd	bd	bd	bd	bd	bd	nd
Mn	0.02	0.00	0.05	0.04	0.06	0.03	0.04	0.07	0.11	0.11	bd	nd
Ni	4.54	19.93	2.33	0.64	5.48	3.28	3.53	1.59	0.70	1.32	2.17	1.98
V	bd	bd	bd	bd	0.02	bd	0.03	bd	bd	bd	0.01	nd
Cu	0.76	4.18	2.28	1.31	3.84	0.07	0.03	0.09	0.06	0.17	bd	0.05
Co	0.06	0.23	0.27	0.07	0.42	0.15	0.21	0.17	0.11	0.13	0.21	nd
S	33.60	33.00	35.97	35.90	35.12	37.93	37.50	36.95	37.38	36.90	37.18	38.40
Total	98.14	99.33	101.07	99.34	99.85	100.11	99.99	100.85	101.09	101.13	100.29	98.94

Sulfides

Sulfides

	nphibole ite	pk-G-22-13 Type II clinopyroxenite										
	(4.1)	(4)	(4)	(4)	(4)	(2)	(2)	(2)	(1)	(1)	(1)	(3.2)
	n/d	E	E	E	E	E	E	E	E	E	E	n/d
Fe	54.30	61.74	61.46	61.38	61.28	61.22	61.47	61.17	61.96	61.14	61.76	53.76
Mg	nd	bd	bd	bd	0.02	0.00	0.01	bd	0.01	0.01	bd	nd
Ti	nd	0.03	0.02	0.03	0.02	0.01	bd	0.02	0.02	0.02	0.02	nd
Cr	nd	bd	bd	0.01	bd	0.01	bd	bd	0.01	bd	0.01	nd
Mn	nd	0.02	0.02	0.01	0.05	bd	bd	bd	0.02	0.03	0.05	nd
Ni	5.41	1.71	1.63	1.32	1.65	1.55	1.38	1.57	1.40	1.58	0.91	3.75
V	nd	bd	bd	bd	bd	bd	0.01	bd	bd	0.01	bd	nd
Cu	0.06	0.05	0.05	0.01	0.07	0.04	0.05	0.03	0.01	0.07	0.37	1.60
Co	nd	0.24	0.21	0.17	0.24	0.22	0.21	0.19	0.17	0.22	0.08	nd
S	35.69	36.83	36.50	36.56	36.90	36.52	36.57	36.94	37.03	36.74	36.68	39.05
Total	95.46	100.61	99.90	99.48	100.22	99.57	99.70	99.94	100.63	99.82	99.88	98.16

Sulfides

Sulfides

			pk-G-22-14 Type II clinopyroxenite									
	(3.3)	(5.1)	(5)	(5)	(5)	(1.1)	(1.1)	(3.1)	(3.1)	(5.1)	(1)	(1)
	n/d	n/d	E	E	E	n/d	n/d	n/d	n/d	n/d	O	O
Fe	56.41	54.29	62.36	62.21	62.56	56.37	56.21	56.95	56.88	55.53	35.94	36.75
Mg	nd	nd	bd	bd	bd	nd	nd	nd	nd	nd	0.01	bd
Ti	nd	nd	bd	bd	bd	nd	nd	nd	nd	nd	bd	bd
Cr	nd	nd	bd	bd	bd	nd	nd	nd	nd	nd	bd	bd
Mn	nd	nd	0.04	0.06	0.04	nd	nd	nd	nd	nd	0.03	bd
Ni	1.75	2.87	1.11	1.45	1.12	1.57	1.64	1.32	1.12	2.04	27.74	28.19
V	nd	nd	0.01	0.02	bd	nd	nd	nd	nd	nd	bd	bd
Cu	0.02	0.10	0.04	0.01	0.01	0.01	0.01	bd	bd	0.05	2.88	1.81
Co	nd	nd	0.18	0.23	0.16	nd	nd	nd	nd	nd	0.30	0.32
S	39.45	40.74	37.24	36.34	37.09	39.23	39.24	38.66	38.48	39.04	33.17	32.97
Total	97.64	97.99	100.98	100.32	101.00	97.18	97.10	96.92	96.49	96.66	100.07	100.06

Sulfides

Sulfides

	pk-G-20-7 Type I spinel lherzolite										pk-G	
	(2)	(2)	(2)	(3)	(3)	(3)	(3)	(4)	(4)	(4)	(1.8)	(1.9)
	O	O	O	E	E	E	E	I	I	I	I	O
Fe	38.09	38.48	36.96	35.69	35.75	36.00	35.82	35.88	35.53	35.74	56.11	36.05
Mg	0.02	0.00	0.02	bd	bd	bd	bd	bd	0.01	0.01	0.04	0.00
Ti	0.02	0.00	0.01	0.01	bd	bd	bd	bd	0.01	bd	bd	bd
Cr	0.02	0.01	0.02	0.01	bd	0.01	0.01	0.02	bd	0.03	bd	bd
Mn	bd	bd	0.01	0.02	0.01	0.02	bd	bd	bd	0.02	0.04	bd
Ni	28.72	26.67	28.80	30.68	30.88	30.95	30.79	30.98	31.32	30.08	4.52	29.92
V	bd	bd	bd	bd	bd	0.02	0.00	0.01	bd	0.01	0.01	bd
Cu	0.18	0.85	0.22	0.76	0.09	0.27	0.23	0.03	0.18	0.62	0.36	0.18
Co	0.19	0.26	0.23	0.23	0.27	0.21	0.31	0.27	0.24	0.19	0.13	0.39
S	33.26	33.64	32.71	32.85	33.29	33.35	33.39	33.40	33.22	32.20	36.94	32.96
Total	100.50	99.91	98.98	100.26	100.29	100.84	100.57	100.59	100.52	98.90	98.16	99.51

Sulfides

Sulfides

	-20-10 (thin section a) Type II / Type I composite						pk-G-20-10 (thin section b) Type II / Type I composite	
	(1.9)	(1.3)	(1.3)	(3.1)	(4.1)	(T)	(3)	(7)
	O	E	E	n/d	n/d	F	n/d	E
Fe	35.57	30.67	29.82	36.84	37.64	26.18	63.67	39.90
Mg	0.01	bd	0.01	nd	nd	nd	0.01	bd
Ti	0.02	bd	bd	nd	nd	nd	0.02	bd
Cr	0.19	0.01	0.01	nd	nd	nd	bd	0.01
Mn	0.02	0.02	0.01	nd	nd	nd	0.06	0.06
Ni	28.99	32.97	35.33	26.18	23.39	27.84	0.34	19.36
V	bd	bd	bd	nd	nd	nd	0.01	0.01
Cu	0.51	2.47	1.33	1.33	1.44	11.91	0.14	7.26
Co	0.34	0.35	0.28	nd	nd	nd	0.08	0.29
S	33.05	32.42	32.36	33.85	33.89	31.06	36.54	33.22
Total	98.71	98.90	99.17	98.20	96.36	97.00	100.87	100.11

FeTi oxides

FeTi Oxides in GVF xenoliths

	pk-G-22-1 Amphibole Cpxenite			pk-G-22-2 Poikilitic Kaersutite					pk-G-22-9 Amphibole Clinopyroxenite				
	magnetite (4)			magnetite (1)	ilmenite (3)				magnetite (8)	magnetite (8)	magnetite (8)	magnetite (4)	magnetite (4)
SiO ₂	0.13			0.13	0.05				nd	nd	nd	nd	nd
TiO ₂	0.06			0.07	50.71				0.01	0.01	0.01	bd	bd
Al ₂ O ₃	0.01			0.22	0.70				0.41	0.52	0.54	0.35	0.42
V ₂ O ₅	0.06			0.09	2.96				bd	bd	0.01	0.01	bd
Cr ₂ O ₃	0.01			0.03	0.00				bd	0.01	0.01	bd	bd
Fe ₂ O ₃	90.52			89.55	35.13				84.63	83.74	82.04	83.83	84.34
MnO	0.10			0.05	0.37				bd	0.00	0.13	0.01	0.03
MgO	0.04			0.00	10.36				0.27	0.41	0.40	0.38	0.30
NiO	nd			nd	nd				0.92	1.01	0.77	1.47	1.47
CoO	nd			nd	nd				0.11	0.16	0.07	0.15	0.15
Cu ₂ O	nd			nd	nd				0.13	0.73	0.03	0.45	0.37
SO ₃ ⁼	nd			nd	nd				0.94	1.55	1.05	1.32	0.94
"Total"	90.93			90.14	100.28				87.42	88.14	85.07	87.97	88.01

Data collected on SMU JEOL microprobe (Unpublished data from
Data collected Univ Colorado Boulder (July 2017)

FeTi oxides

FeTi Oxide Kempston (1984)

	pk-G_22-11 Amphibole Clinopyroxenite		pk-G-22-14 Amphibole Cpxenite
	magnetite (6c)	magnetite (3b)	magnetite (6)
SiO ₂	0.41	1.02	nd
TiO ₂	0.14	0.20	0.06
Al ₂ O ₃	0.20	0.15	0.17
V ₂ O ₅	nd	nd	0.05
Cr ₂ O ₃	0.30	0.42	bd
Fe ₂ O ₃	90.98	90.64	91.45
MnO	0.16	0.17	0.02
MgO	0.03	0.07	0.04
NiO	nd	nd	0.36
CoO	nd	nd	0.08
Cu ₂ O	nd	nd	3.66
SO ₃ ⁼	nd	nd	1.47
"Total"	92.22	92.67	97.36