

Table S1. Chemical composition of associated olivine and amphibole inclusions.

	Fayalite	Ferro- actinolite
SiO ₂	30.59	52.09
Al ₂ O ₃	0.03	0.19
TiO ₂	0.03	0.01
FeO	51.21	19.02
MnO	17.91	3.22
ZnO	0.00	0.11
MgO	0.97	7.02
CaO	0.00	10.65
Na ₂ O~	0.00	0.02
K ₂ O	0.00	0.00
F	0.11	0.00
H ₂ O*	0.00	1.05
TOTAL	100.85	100.43
O=F	0.04	0.00
TOTAL	100.81	100.43

Table S2. LA-ICP-MS analyses of clino-ferro-suenoite and standards

All_values_are_in_ppm

Element	GSD2g-1	GSD2g-2	BCR2g	191917 54_1	191917 54_2	191917 54_3	ARM 3	GSD2 g-3	GSD2 g-4
Li7	42.87	42.29	9.26	<0.56	<0.56	<0.59	17.1	42.4	42.75
Be9	46.37	44.12	1.67	<0.278	0.035	0.106	5.24	45.17	45.44
B11	39.49	40.88	4.85	<2.32	<2.37	<2.30	52.9	42.7	38.48
Mg25	21228.89	21389.06	21585.84	34188.	33395.	33298.	2077	21207	21371
				9	09	06	9.43	.9	.82
Si29	260899.91	260899.91	253000.2	235589	235589	235589	2818	26089	26089
				.47	.45	.47	58	9.88	9.88
Ca43	46126.54	45841.14	49150.39	7257.3	6597.7	6904.4	3745	46176	45864
				5	5	4	9.16	.44	.16
Ca44	45768.07	46259.32	48833.1	6839.9	7222.5		3690	45893	46064
				7403	9	9	1.61	.67	.52
Sc45	41.82	42.05	34.76	12.13	11.06	11.28	15.24	41.89	41.95
							6111.	7104.	7097.
Ti49	7110.29	7088.55	13380.06	51.8	58.7	59.42	33	66	24
V51	44.69	44.04	425.39	1.26	1.136	1.386	10.74	44.36	44.42
Cr53	44.71	44.11	16.03	<1.21	<1.29	<1.22	9.22	43.1	45.44
				59377.	59499.	58748.	368.0	640.2	641.5
Mn55	640.07	642.09	1539.06	93	26	14	7	1	7
				267776	268454	267658	4501	92958	92010
Fe57	93153.08	91558.02	96240.99	.03	.06	.22	9.33	.86	.83
Co59	38.32	39.33	37.61	<0.170	<0.160	0.2	7.13	38.54	38.95
Ni60	45.85	45.97	12.39	<0.36	0.38	<0.37	10.88	47.07	45.07
Cu65	37.87	36.01	16.64	<0.33	<0.38	<0.31	11.73	37.11	36.93
Rb85	38.26	38.34	45.47	<0.094	<0.090	<0.092	7.1	38.92	37.85
Sr88	66.28	66.18	326.64	0.089	0.105	0.096	19.04	66.79	65.83
Y89	42.43	43.43	31.88	0.055	0.082	0.066	7.33	42.92	42.84
Zr90	44.72	46.06	174.9	0.038	0.057	0.049	12.12	44.62	45.85
Nb93	45.87	45.37	11.5	0.327	0.291	0.374	12.36	46.27	45.19
				<0.019	<0.014	<0.020			
Cs133	31.98	32.07	1.14	0	8	8	7.03	32.23	31.87
Ba137	45.23	44.02	644.48	0.078	0.03	0.076	27.12	44.19	45.04
						<0.005			
La139	39.77	39.31	24.06	0.001	0.0041	0	6.37	39.72	39.45
Ce140	42.54	42.35	51.61	0.0157	0.0117	0.0133	8.14	42.82	42.19
Pr141	42.28	42.37	6.55	0.0059	0.0082	0.0098	5.57	42.3	42.33
Nd146	43.61	44.89	28.76	0.038	0.073	0.119	7.96	44.88	43.68
Sm149	42.93	43.65	6.03	0.099	0.085	0.097	6.08	43.6	43
Eu151	41.8	41.82	1.843	0.0576	0.0553	0.08	5.61	41.72	41.87
Gd157	41.9	42.49	6.28	0.084	0.068	0.069	5.77	42.85	41.67
Tb159	42.39	42.73	0.97	0.0063	0.0112	0.0111	6.45	42.31	42.72
Dy163	42.24	44.19	6.13	0.0224	0.037	0.034	6.24	43.35	42.92
					0.0013	<0.003			
Ho165	43.18	43.22	1.137	0.002	7	3	7	43.19	43.21

Er167	41.51	42.51	3.37	0.0091	<0.00	<0.00	6.39	42	41.92
				0.0006	<0.003	<0.003			
Tm169	42.32	43.03	0.492	4	10	13	6.23	42.91	42.44
Yb173	45.72	46.96	3.36	<0.026	0.0039	0.0039	9.09	47.09	45.69
						<0.004			
Lu175	46.37	46.43	0.465	<0.00	<0.00	4	6.47	46.4	46.39
Hf177	40.05	40.56	4.43	0.0161	0.0097	0.0132	6.13	40.64	40.01
Ta181	43.43	42.92	0.766	0.0176	0.0135	0.0219	6.36	43.03	43.32
Pb208	30.8	30.52	10.95	0.099	<0.034	0.045	12.68	30.76	30.61
Th232	42.93	43.84	5.56	0.0432	0.0195	0.0153	3.37	43.27	43.39
U238	42.15	41.97	1.686	0.012	0.0054	0.005	3.57	42.57	41.71

l_sigma_error.

Element	GSD2g-1	GSD2g-2	BCR2g	191917 54_1	191917 54_2	191917 54_3	ARM 3	GSD2 g-3	GSD2 g-4
Li7	1.54	1.5	0.52	0.22	0.22	0.23	0.76	1.53	1.56
Be9	2.8	2.65	0.31	0.098	0.035	0.062	0.63	3.07	3.2
B11	3.8	3.83	1.51	0.95	0.95	0.95	6.2	5.42	5.32
				1063.3		1045.4	657.4	675.7	686.6
Mg25	658.11	663.16	670.32	7	1043	8	9	6	3
				7460.7	7460.8	7461.0		8266.	8266.
Si29	8270.55	8268.3	8017.4	2	4	4	8931	1	29
							1224.	1495.	1494.
Ca43	1475.32	1461.58	1561.83	264.5	246.08	257.48	18	17	24
							1162.	1455.	1473.
Ca44	1411.91	1427.04	1508.59	231.87	215.46	228.52	98	49	1
Sc45	1.38	1.37	1.15	0.44	0.41	0.42	0.58	1.37	1.37
							186.6	216.6	216.5
Ti49	216.66	215.83	405.93	2.42	2.65	2.68	3	3	7
V51	1.48	1.46	13.39	0.083	0.078	0.088	0.42	1.52	1.54
Cr53	2.71	2.58	1.34	0.49	0.51	0.49	1.07	2.98	3.27
				1791.6	1796.3	1775.0			
Mn55	19.37	19.43	46.49	7	7	1	11.19	19.44	19.5
				8737.1		8995.6	1545.	3258.	3304.
Fe57	2990.35	2944.55	3113.02	9	8875.3	6	31	55	63
Co59	1.37	1.4	1.35	0.067	0.067	0.07	0.34	1.57	1.64
Ni60	2.1	2.08	0.73	0.15	0.15	0.16	0.76	2.56	2.58
Cu65	1.75	1.67	0.88	0.13	0.15	0.14	0.77	2.14	2.25
Rb85	1.35	1.35	1.61	0.037	0.035	0.036	0.31	1.57	1.59
Sr88	2.11	2.11	10.28	0.014	0.014	0.014	0.66	2.23	2.23
Y89	1.43	1.46	1.09	0.011	0.013	0.012	0.29	1.57	1.61
Zr90	1.76	1.81	6.77	0.012	0.015	0.016	0.6	2.12	2.28
Nb93	1.58	1.57	0.43	0.028	0.027	0.031	0.5	1.8	1.82
Cs133	1.01	1.01	0.053	0.008	0.0066	0.0079	0.24	1.04	1.04
Ba137	1.76	1.7	23.13	0.028	0.015	0.024	1.22	1.95	2.06
La139	1.26	1.24	0.77	0.001	0.0021	0.0015	0.23	1.3	1.31
Ce140	1.36	1.35	1.65	0.0038	0.0038	0.0036	0.29	1.44	1.44
Pr141	1.29	1.29	0.21	0.0021	0.0025	0.0027	0.19	1.29	1.29
Nd146	1.72	1.76	1.17	0.013	0.018	0.023	0.42	2.12	2.16
Sm149	1.52	1.53	0.29	0.023	0.021	0.023	0.31	1.65	1.66
Eu151	1.3	1.29	0.082	0.0091	0.0089	0.011	0.2	1.29	1.3

Gd157	1.58	1.59	0.31	0.022	0.018	0.019	0.31	1.83	1.85
Tb159	1.33	1.34	0.043	0.0021	0.0028	0.0031	0.22	1.37	1.4
Dy163	1.71	1.79	0.29	0.008	0.01	0.01	0.34	2.17	2.26
Ho165	1.32	1.32	0.048	0.0012	7	0.0017	0.23	1.31	1.31
Er167	1.43	1.46	0.17	0.0053	<0.00	<0.00	0.28	1.57	1.6
Tm169	1.37	1.39	0.027	0.0006	0.0009	0.0009			
Yb173	1.81	1.86	0.19	4	5	6	0.23	1.49	1.51
Lu175	1.41	1.41	0.025	0.011	0.0039	0.0039	0.46	2.23	2.26
Hf177	1.37	1.38	0.2	<0.00	<0.00	0.0014	0.21	1.41	1.41
Ta181	1.36	1.35	0.036	0.0072	0.0056	0.0066	0.27	1.47	1.48
Pb208	0.97	0.96	0.36	0.004	0.003	0.004	0.22	1.4	1.42
Th232	1.4	1.43	0.19	0.015	0.014	0.014	0.42	0.99	0.99
U238	1.38	1.37	0.064	0.0054	0.0036	0.0032	0.13	1.52	1.55
				0.0023	0.0016	0.0015	0.13	1.52	1.53

Minimum_detection_limits_(99%_confidence).

Element	GSD2g-1	GSD2g-2	BCR2g	191917 54_1	191917 54_2	191917 54_3	ARM 3	GSD2 g-3	GSD2 g-4
Li7	1.01	0.909	0.828	0.564	0.562	0.588	0.894	0.75	0.746
Be9	<0.00000	<0.00000	0.231	0.278	<0.000	<0.000	0.362	<0.00	0.228
B11	4.48	3.9	3.5	2.32	2.37	2.3	3.27	2.86	2.97
Mg25	3.15	3.06	2.83	1.96	1.99	2.07	3.29	2.78	3.11
Si29	579.6	525.96	490.3	338.64	338.88	338.22	506.1	450.5	457.4
Ca43	252.77	240.16	237.97	157.11	162.87	170.57	9	6	8
Ca44	86.38	77.41	72.33	50.23	50.78	50.85	221.0	224.0	
Sc45	0.658	0.575	0.54	0.372	0.367	0.378	245.7	8	5
Ti49	1.72	1.65	1.28	1.02	1.01	0.875	78.61	68.65	70.09
V51	0.14	0.105	0.0828	0.0829	0.0717	0.0783	0.541	0.486	0.496
Cr53	2.44	1.94	1.78	1.21	1.29	1.22	0.81	1.55	1.31
Mn55	0.57	0.515	0.485	0.324	0.346	0.354		0.094	
Fe57	25.61	22.56	21.44	14.36	14.84	14.27	0.113	0.107	8
Co59	0.264	0.25	0.233	0.17	0.16	0.162	1.61	1.61	1.67
Ni60	0.802	0.573	0.444	0.361	0.32	0.367	0.53	0.476	0.48
Cu65	0.575	0.592	0.473	0.33	0.379	0.313	0.20.83	18.28	18.4
Rb85	0.137	0.138	0.133	0.0937	0.0896	0.0917	0.261	0.231	0.228
Sr88	0.0265	<0.00000	0.0113	0.0157	0.0115	0.0143	0.622	0.528	0.6
Y89	0.0146	0.0133	0.0124	0.0121	8	8	0.509	0.464	0.473
Zr90	<0.00000	<0.00000	0.0256	<0.000	<0.000	0.0185	0.135	0.119	0.121
Nb93	0.0213	0.0138	<0.00000	0.0179	0.0207	0.0163	0.027	0.029	0.019
Cs133	0.0278	0.0202	0.0238	0.019	0.0148	0.0208	8	1	1
Ba137	<0.00000	0.0536	<0.00000	0.0346	00	00	0.013	0.011	<0.00

La139	<0.00000	<0.00000	<0.00000	<0.000 00	<0.000 00	0.0050 2	<0.00 000	<0.00 000	<0.00 000
Ce140	<0.00000	<0.00000	<0.00000	<0.000 00	0.0044 8	<0.000 00	<0.00 000	<0.00 000	0.006 06
Pr141	0.00584	<0.00000	0.00498	<0.000 00	<0.000 00	<0.000 00	<0.00 000	<0.00 000	0.004 79
Nd146	<0.00000	<0.00000	0.0288	<0.000 00	<0.000 00	<0.000 00	<0.00 000	0.028 000	<0.00 000
Sm149	<0.00000	<0.00000	0.0354	<0.000 00	<0.000 00	<0.000 00	<0.00 000	<0.00 000	<0.00 000
Eu151	<0.00000	<0.00000	<0.00000	<0.000 00	<0.000 00	<0.000 00	<0.00 000	0.008 88	0.008 85
Gd157	<0.00000	0.0351	0.0326	0.0226 00	<0.000 00	<0.000 00	<0.00 000	<0.00 000	<0.00 000
Tb159	<0.00000	<0.00000	<0.00000	<0.000 00	<0.000 00	0.0034 00	0.020 6	0.025 7	<0.00 000
Dy163	<0.00000	<0.00000	<0.00000	<0.000 00	<0.000 00	0.0033 3	0.007 08	<0.00 000	0.004 41
Ho165	<0.00000	0.00498	<0.00000	<0.000 00	<0.000 00	<0.000 00	0.022 3	<0.00 000	<0.00 000
Er167	0.0243	<0.00000	0.0206	<0.000 00	<0.000 00	0.0031 3	0.006 66	0.004 14	0.004 13
Tm169	<0.00000	0.00472	<0.00000	<0.000 00	0.0031 00	<0.000 00	<0.00 000	0.024 7	<0.00 000
Yb173	<0.00000	0.0283	0.0262	0.0256 00	<0.000 00	0.0044 4	0.004 72	<0.00 000	<0.00 000
Lu175	0.0052	<0.00000	<0.00000	<0.000 00	<0.000 00	<0.000 00	<0.00 000	<0.00 000	<0.00 000
Hf177	0.0258	<0.00000	0.0219	0.0051 9	<0.000 00	0.0031 2	0.004 69	<0.00 000	<0.00 000
Ta181	<0.00000	<0.00000	<0.00000	<0.000 00	<0.000 00	0.0031 2	0.004 69	<0.00 000	<0.00 000
Pb208	0.0495	0.0403	0.0431	0.0267 00	0.0338 00	0.0295 00	0.046 7	0.045 8	0.034 7
Th232	<0.00000	<0.00000	<0.00000	<0.000 00	<0.000 00	<0.000 00	<0.00 000	<0.00 000	<0.00 000
U238	<0.00000	<0.00000	<0.00000	<0.000 00	<0.000 00	<0.000 00	<0.00 000	<0.00 000	0.002 91