

AM-91-459

An experimental determination of calcic amphibole solid solution along the  
join tremolite-tschermakite

Moonsup Cho, W. G. Ernst

For deposit: Table 5

American Mineralogist, 0, , 985-1001.

Table 5. Compositions of clinopyroxene, orthopyroxene, garnet, Mg-staurolite, sapphirine, talc, zoisite, and anorthite

Run no.	<u>Clinopyroxene</u>								
	TS1	TS1	HbT20	HbT23	TS3	TS3	Hb17C	Hb17C	TS2
P (kb)	12.20	12.20	12.20	14.96	14.96	14.96	14.96	14.96	18.08
T (°C)	900	900	900	900	900	900	900	900	900
SiO <sub>2</sub>	53.11	52.42	48.81	49.69	52.85	51.47	53.41	51.27	54.29
Al <sub>2</sub> O <sub>3</sub>	3.16	8.63	10.08	12.15	5.46	7.65	4.20	8.61	7.81
FeO*	0.05	0.06	0.19	0.17	0.09	0.01	0.02	0.03	0.04
MnO	0.01	n.d.**	n.d.	n.d.	0.05	0.02	0.02	0.02	0.01
MgO	18.0	16.37	14.45	14.49	17.18	16.57	17.11	16.89	15.72
CaO	24.13	24.16	24.11	23.35	23.90	24.18	24.09	21.02	22.18
Na <sub>2</sub> O	0.01	n.d.	n.d.	0.02	n.d.	n.d.	0.01	0.02	0.03
K <sub>2</sub> O	n.d.	n.d.	n.d.	0.02	n.d.	0.02	0.01	0.01	0.02
Total	98.53	101.65	97.64	99.89	99.53	99.91	98.86	97.86	100.10
	<u>Cations based on 6 oxygens</u>								
Si	1.935	1.845	1.797	1.778	1.902	1.848	1.935	1.858	1.920
Al	0.136	0.358	0.438	0.513	0.232	0.324	0.179	0.368	0.325
Fe	0.001	0.002	0.006	0.005	0.003	0.000	0.001	0.001	0.001
Mn	0.000	n.d.	n.d.	n.d.	0.002	0.001	0.001	0.001	0.000
Mg	0.982	0.859	0.793	0.773	0.922	0.887	0.924	0.913	0.829
Ca	0.942	0.911	0.951	0.895	0.922	0.930	0.935	0.817	0.840
Na	0.001	n.d.	n.d.	0.002	n.d.	n.d.	0.001	0.001	0.002
K	n.d.	n.d.	n.d.	0.001	n.d.	0.001	n.d.	0.001	0.001
Sum	3.997	3.976	3.984	3.967	3.982	3.991	3.976	3.959	3.919

\* Total Fe as FeO. \*\* n.d. = not detected.

Sp no	<u>Orthopyroxene</u>				<u>Garnet</u>			
	HbX14	HbX14	Hb23	TS10	Hb17C	TS9	TS2.core	Ts2.rim
P (kb)	21	21	18.08	20.7	14.96	17.82	18.08	18.08
T (°C)	850	850	900	850	900	850	900	900
SiO <sub>2</sub>	54.03	55.87	58.36	57.25	44.31	43.72	43.14	42.59
Al <sub>2</sub> O <sub>3</sub>	9.21	6.62	2.31	9.70	24.89	25.01	24.33	24.78
FeO*	0.21	0.16	0.08	0.02	0.13	0.12	0.05	0.07
MnO	0.07	0.04	0.01	0.02	0.08	0.02	0.04	0.03
MgO	34.97	35.96	38.18	34.84	23.21	22.38	23.03	22.45
CaO	0.45	1.02	0.46	0.50	7.85	8.51	8.67	8.96
Na <sub>2</sub> O	n.d.**	n.d.	n.d.	n.d.	n.d.	n.d.	0.03	n.d.
K <sub>2</sub> O	n.d.	n.d.	0.01	n.d.	0.01	0.01	0.02	n.d.
Total	98.93	99.69	99.40	102.33	100.47	99.77	99.31	98.88
	<u>Cations based on 6 oxygens</u>				<u>Cations based on 12 oxygens</u>			
Si	1.830	1.880	1.964	1.865	3.024	3.011	2.992	2.969
Al	0.367	0.263	0.092	0.373	2.002	2.030	1.989	2.037
Fe	0.006	0.005	0.002	0.001	0.007	0.007	0.003	0.004
Mn	0.002	0.001	0.000	0.000	0.004	0.001	0.002	0.002
Mg	1.765	1.804	1.915	1.692	2.361	2.298	2.381	2.333
Ca	0.016	0.037	0.017	0.017	0.574	0.628	0.645	0.669
Na	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.004	n.d.
K	n.d.	n.d.	n.d.	n.d.	0.001	0.001	0.002	n.d.
Sum	3.987	3.989	3.990	3.948	7.975	7.975	8.017	8.013

\* Total Fe as FeO. \*\* n.d. = not detected.

	<u>Mg-Staurolite</u>				<u>Sapphirine</u>	
<u>Run no.</u>	<u>HbT25</u>	<u>HbT25</u>	<u>HbT25</u>	<u>HbT29</u>	<u>HbT18</u>	<u>HbT20</u>
P (kb)	20.90	20.90	20.90	23.85	10.07	12.20
T (°C)	750	750	750	850	850	900
SiO <sub>2</sub>	30.01	30.04	30.44	29.93	15.97	17.66
Al <sub>2</sub> O <sub>3</sub>	57.82	57.20	57.41	57.71	60.10	57.90
FeO*	0.18	0.22	0.25	0.19	0.30	0.27
MnO	n.d.**	0.02	0.04	0.00	0.07	0.04
MgO	9.39	9.32	9.26	9.61	21.67	22.66
CaO	0.06	0.08	0.04	0.07	0.08	0.14
Na <sub>2</sub> O	n.d.	n.d.	n.d.	0.03	n.d.	n.d.
K <sub>2</sub> O	n.d.	n.d.	0.01	0.06	n.d.	n.d.
Total	97.47	96.87	97.44	97.58	98.18	98.67
	<u>Cations based on 46 oxygens</u>				<u>Cations based on 20 oxygens</u>	
Si	7.824	7.880	7.935	7.800	1.869	2.054
Al	17.764	17.682	17.639	17.727	8.291	7.940
Fe	0.039	0.047	0.054	0.042	0.030	0.026
Mn	n.d.	0.005	0.008	0.000	0.007	0.004
Mg	3.649	3.643	3.599	3.733	3.781	3.930
Ca	0.018	0.022	0.010	0.018	0.010	0.018
Na	n.d.	n.d.	n.d.	0.015	n.d.	n.d.
K	n.d.	n.d.	n.d.	0.018	n.d.	n.d.
Sum	29.294	29.279	29.245	29.353	13.986	13.974

\* Total Fe as FeO. \*\* n.d. = not detected.

Sp no	<u>Talc</u>	<u>Zoisite</u>		<u>Anorthite</u>	
	HbX12	HbT3	HbX18	HbT18	HbT19
P, kb	17.8	12	15.0	10.07	12.20
T, °C	750	750	850	850	900
SiO <sub>2</sub>	58.43	39.69	39.86	43.57	42.77
Al <sub>2</sub> O <sub>3</sub>	4.21	33.11	33.36	35.52	35.45
FeO*	0.01	n.d.	0.03	n.d.	0.03
MnO	0.0	n.d.	0.05	0.04	n.d.
MgO	27.37	0.14	0.51	n.d.	n.d.
CaO	0.82	24.26	24.25	19.90	19.79
Na <sub>2</sub> O	0.03	n.d.	n.d.	0.08	0.03
K <sub>2</sub> O	0.00	0.02	0.01	0.01	n.d.
Total	90.91	97.21	98.06	99.12	98.07
	<u>Q = 11</u>	<u>Q = 12.5</u>		<u>Q = 8</u>	
Si	3.871	3.023	3.010	2.034	2.019
Al	0.329	2.972	2.970	1.954	1.972
Fe	0.001	n.d.	0.001	n.d.	0.001
Mn	0.002	n.d.	0.003	0.001	n.d.
Mg	2.703	0.016	0.058	n.d.	n.d.
Ca	0.058	1.979	1.963	0.996	1.001
Na	0.002	n.d.	0.001	0.007	0.003
K	0.000	0.002	0.001	0.001	n.d.
Sum	6.967	7.992	8.006	4.993	4.996

\* Total Fe as FeO. \*\* n.d. = not detected.