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Supporting Information for

High-pressure and high-temperature single-crystal elasticity of Cr-pyrope: implications for the density and seismic velocity of subcontinental lithospheric mantle

Jingui Xu[1, 2], Dawei Fan[1*], Bo Li[3], Sergey N. Tkachev[4], Vitali B. Prakapenka[4], Dongzhou Zhang[2], Guangzhong Yang[5], Yi Zhou[6], and Wenge Zhou[1]

[1]Key Laboratory for High-Temperature and High-Pressure Study of the Earth's Interior, Institute of Geochemistry, Chinese Academy of Sciences, Guiyang, Guizhou 550081, China.

[2] Hawai'i Institute of Geophysics and Planetology, School of Ocean and Earth Science and Technology, University of Hawai'i at Manoa, Honolulu, Hawaii 96822, United States.

[3] Research Institute of Petroleum Exploration & Development-Northwest (NWGI), PetroChina, Lanzhou, 730060 China

[4] Center for Advanced Radiation Sources, University of Chicago, Chicago, Illinois 60437, United States.

[5] The No. 101 Geological Brigade, Geological and Mineral Exploration and Development Bureau of Guizhou Province, Kaili, Guizhou 556000, China.

[6] School of Geoscience and Technology, Southwest Petroleum University, Chengdu, Sichuan 610500, China

*Corresponding authors: Dawei Fan (fandawei@mail.gyig.ac.cn)

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Text S1

The used third-order Birch-Murnaghan equation of state is described in the following:

$$P = \frac{3K_{T0}}{2}\left[\left(\frac{V_{T0}}{V}\right)^{\frac{7}{3}} - \left(\frac{V_{T0}}{V}\right)^{\frac{5}{3}}\right]\left\{1 + \frac{3}{4}\left((\partial K_T/\partial P)_T - 4\right)\left[\left(\frac{V_{T0}}{V}\right)^{\frac{2}{3}} - 1\right]\right\} \quad (1),$$

where P, V_{T0}, V, K_{T0}, and $(\partial K_T/\partial P)_T$ are pressure, unit-cell volume at temperature and zero-pressure, unit-cell volume at pressure and temperature, zero-pressure bulk modulus, and its pressure derivative, respectively.

The thermal-pressure equation of state is based on the idea of thermal pressure (P_{th}; e.g., (Angel et al., 2014). The total pressure (P) at a given V and T can be expressed as $P(V, T) = P(V, T_{ref}) + P_{th}$. $P(V, T_{ref})$ is the pressure at reference temperature (T_{ref}) which is described by the Birch-Murnaghan equation of state (1). P_{th} used here is proposed by Holland & Powell (2011):

$$P_{th} = \alpha_0 K_{T0}\left(\frac{\theta_E}{\xi_0}\right)\left(\frac{1}{\exp(\theta_E/T) - 1} - \frac{1}{\exp(\theta_E/T_{ref}) - 1}\right) \quad (2),$$

where α_0 is the thermal expansion coefficient at T_{ref}, θ_E is the Einstein temperature, and ξ_0 is given by the following expression (Kroll et al., 2012):

$$\xi_0 = \frac{(\theta_E/T_{ref})^2 \exp(\theta_E/T_{ref})}{\left(\exp(\theta_E/T_{ref}) - 1\right)^2} \quad (3).$$

Text S2

The adiabatic bulk (K_S) and shear (G) modulus at high P and high T are evaluated by the third- or fourth-order finite-strain equations.

(1) For K_S:

$$K_S = K_{S0}(T) \times (1+2f)^{\left(\frac{5}{2}\right)} \times \left(1 + \left(3\left(\frac{\partial K_S}{\partial P}\right)_T - 5\right) \times f\right) \text{ or}$$

$$K_S = K_{S0}(T) \times (1+2f)^{\left(\frac{5}{2}\right)} \times \left(1 + \left(3\left(\frac{\partial K_S}{\partial P}\right)_T - 5\right) \times f + 0.5 \times \left(9K_{S0}(T) \times \left(\frac{\partial^2 K_S}{\partial P^2}\right)_T + 9 \times \left(\frac{\partial K_S}{\partial P}\right)_T^2 - 36 \times \left(\frac{\partial K_S}{\partial P}\right)_T + 35\right) \times f^2\right) \quad (4),$$

$$K_{S0}(T) = K_{S0} + \left(\frac{\partial K_S}{\partial T}\right)_P \times (T - T_{ref}) \quad (5),$$

$$\left(\frac{\partial K_S}{\partial P}\right)_T = \left(\frac{\partial K_S}{\partial P}\right)_{T_{ref}} \times \mathrm{Exp}\int_{T_{ref}}^{T} \alpha \, \mathrm{d}T \quad (6),$$

$$f = 0.5 \times \left(\left(\frac{\rho}{\rho_0(T)}\right)^{\frac{2}{3}} - 1\right) \quad (7),$$

$$\rho_0(T) = \rho_0(T_{ref}) \times \left(\mathrm{Exp}\int_{T_{ref}}^{T} \alpha \, \mathrm{d}T\right)^{-1} \quad (8),$$

where $K_{S0}(T)$ is the adiabatic bulk modulus at room P and temperature (T), f is the Eulerian finite strain, $\left(\frac{\partial K_S}{\partial P}\right)_T$ is the first-order pressure derivative of K_S at temperature T, $\left(\frac{\partial^2 K_S}{\partial P^2}\right)_T$ is the second-order pressure derivative of K_S at T, K_{S0} is the adiabatic bulk modulus at room P-T, $\left(\frac{\partial K_S}{\partial T}\right)_P$ is the temperature derivative of K_S, $\left(\frac{\partial K_S}{\partial P}\right)_{T_{ref}}$ is the first pressure derivative of K_S at T_{ref}, ρ is the density at high P-T, $\rho_0(T)$ is the density at room P and T, $\rho_0(T_{ref})$ is the density at room P-T, and α is the thermal expansion coefficient.

(2) For G

$$G = (1+2f)^{\frac{5}{2}} \times (G_0(T) + b_1 f) \text{ or}$$

$$G = (1 + 2f)^{\frac{5}{2}} \times (G_0(T) + b_1 f + 0.5 b_2 f^2) \quad (9),$$

$$G_0(T) = G_0 + \left(\frac{\partial G}{\partial T}\right)_P \times (T - T_{ref}) \quad (10),$$

$$b_1 = 3K_{T0}(T)\left(\frac{\partial G}{\partial P}\right)_T - 5G_0(T) \quad (11),$$

$$b_2 = 9(K_{T0}^2(T)[\left(\frac{\partial^2 G}{\partial P^2}\right)_T + 1/K_{T0}(T)(\left(\frac{\partial K_T}{\partial P}\right)_T - 4)\left(\frac{\partial G}{\partial P}\right)_T] + \frac{35G_0(T)}{9}) \quad (12),$$

$$\left(\frac{\partial G}{\partial P}\right)_T = \left(\frac{\partial G}{\partial P}\right)_{T_{ref}} \times \text{Exp} \int_{T_{ref}}^{T} \alpha_0 \, dT \quad (13),$$

$$K_{T0} = K_{S0}/(1 + \alpha\gamma T) \quad (14),$$

$$\left(\frac{\partial K_T}{\partial P}\right)_T = (1 + \alpha\gamma T)^{-1} \times (\left(\frac{\partial K_S}{\partial P}\right)_T - \gamma T/K_{T0}(T)\left(\frac{\partial K_T}{\partial T}\right)_P) \quad (15),$$

$$\left(\frac{\partial K_T}{\partial T}\right)_P = \left(\frac{\partial K_S}{\partial T}\right)_P - \alpha\gamma T/(1 + \alpha\gamma T) \quad (16),$$

where $G_0(T)$ is the shear modulus at room P and temperature T, G_0 is the shear modulus at room P-T, $\left(\frac{\partial G}{\partial T}\right)_P$ is the temperature derivative of G, $K_{T0}(T)$ is the isothermal bulk modulus at room-P and T, $\left(\frac{\partial G}{\partial P}\right)_T$ is the first-order pressure derivative of G at T, $\left(\frac{\partial^2 G}{\partial P^2}\right)_T$ is the second-order pressure derivative of G, $\left(\frac{\partial K_T}{\partial P}\right)_T$ is the pressure derivative of the isothermal bulk modulus at T, $\left(\frac{\partial G}{\partial P}\right)_{T_{ref}}$ is the pressure derivative of G at T_{ref}, K_{T0} is the isothermal bulk modulus at room P-T, γ is the Grüneisen parameter, $\left(\frac{\partial K_T}{\partial P}\right)_T$ is the pressure derivative of the isothermal bulk modulus at T, and $\left(\frac{\partial K_T}{\partial T}\right)_P$ is the temperature derivative of the isothermal bulk modulus.

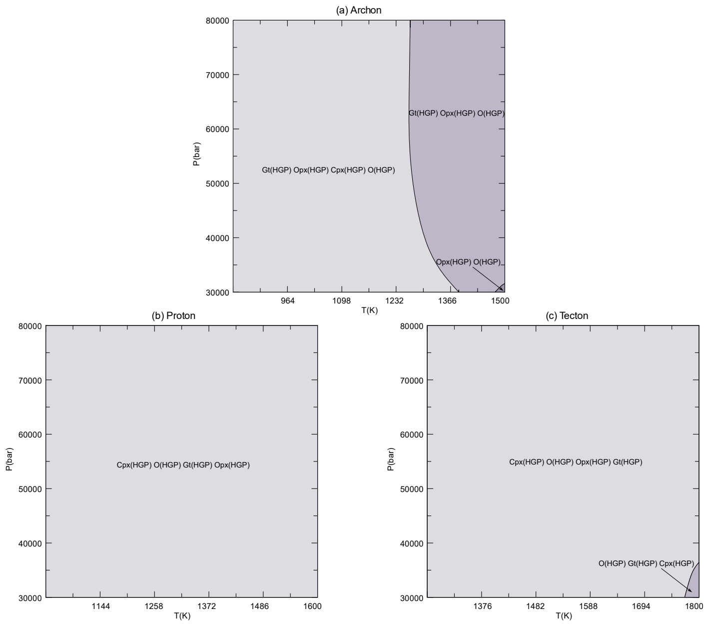

Figure S1. The calculated phase diagrams using Perple_X for the Archon (a), Proton (b), and Tecton (c) SCLM. O-olivine; Opx-orthopyroxene; Cpx-clinopyroxene; Gt-garnet. HGP means the used solution model.

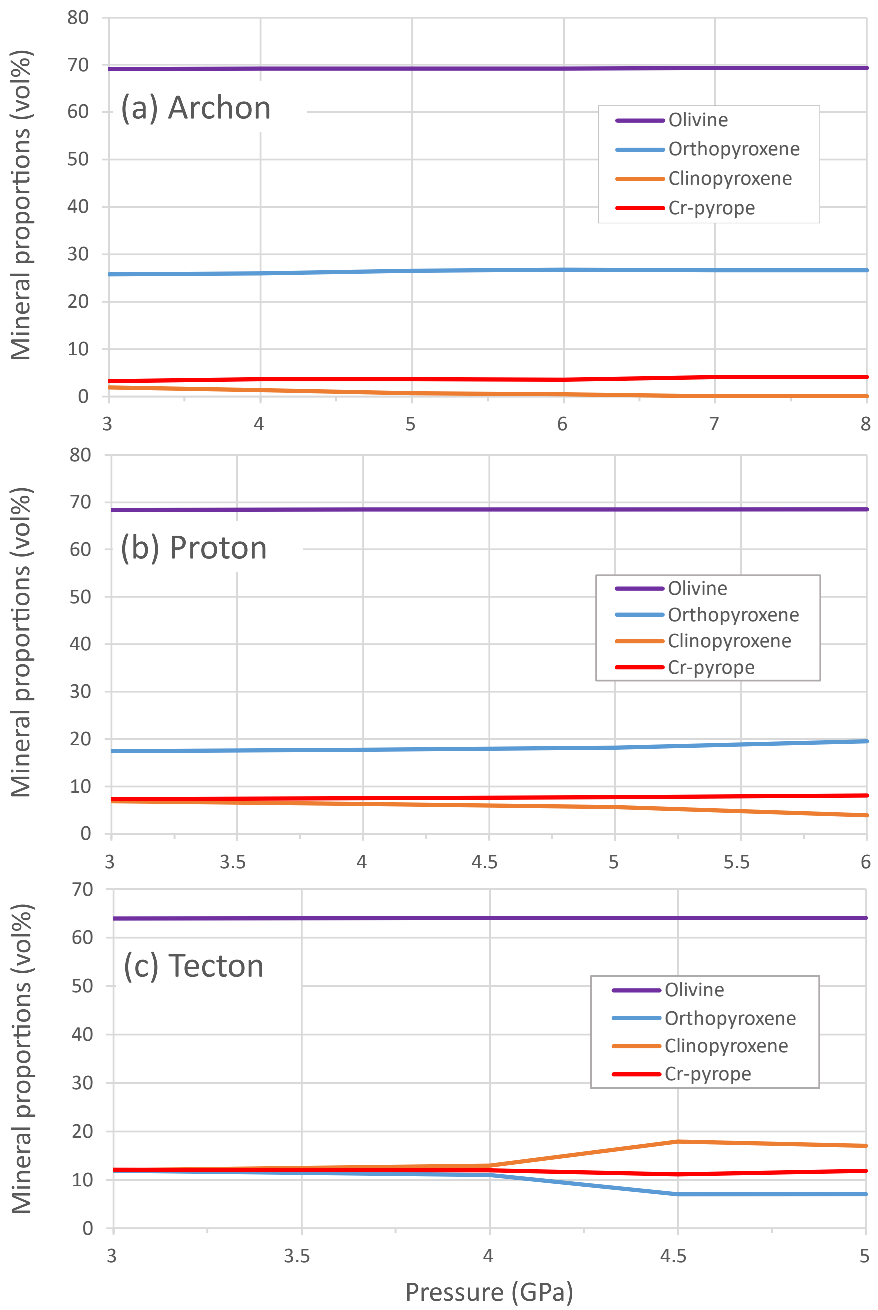

Figure S2. Calculated mineral proportions of three SCLMs, (a) Archon (3-8 GPa), (b) Proton (3-6 GPa), and (c) Tecton (3-5 GPa). The used bulk compositions of the SCLMs are extracted from Griffin et al. (2009), and the used geotherms are taken from Deen et al. (2006).

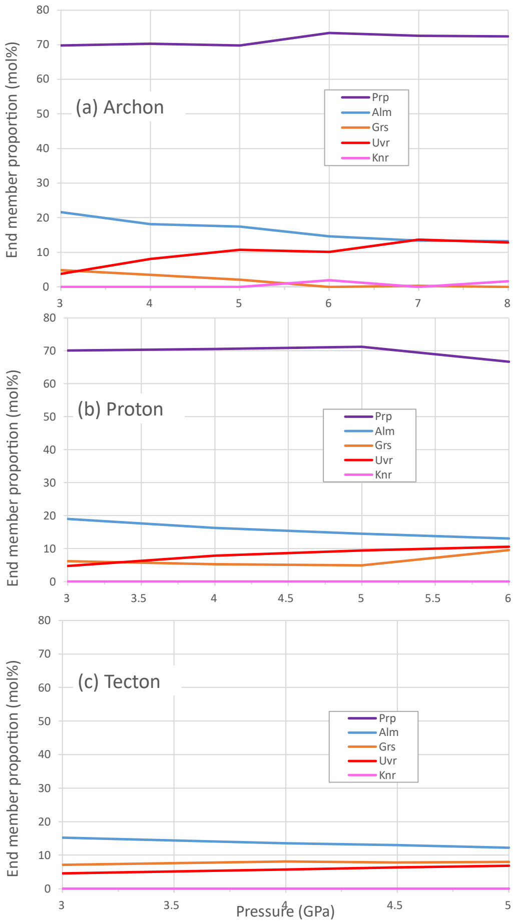

Figure S3. End-member proportions of Cr-pyrope in the Archon (a; 3-8 GPa), Proton (b; 3-6 GPa) and Tecton (c; 3-5 GPa). Prp, Alm, Grs, Uvr and Knr represent pyrope, almandine, grossular, uvarovite and knorringite, respectively.

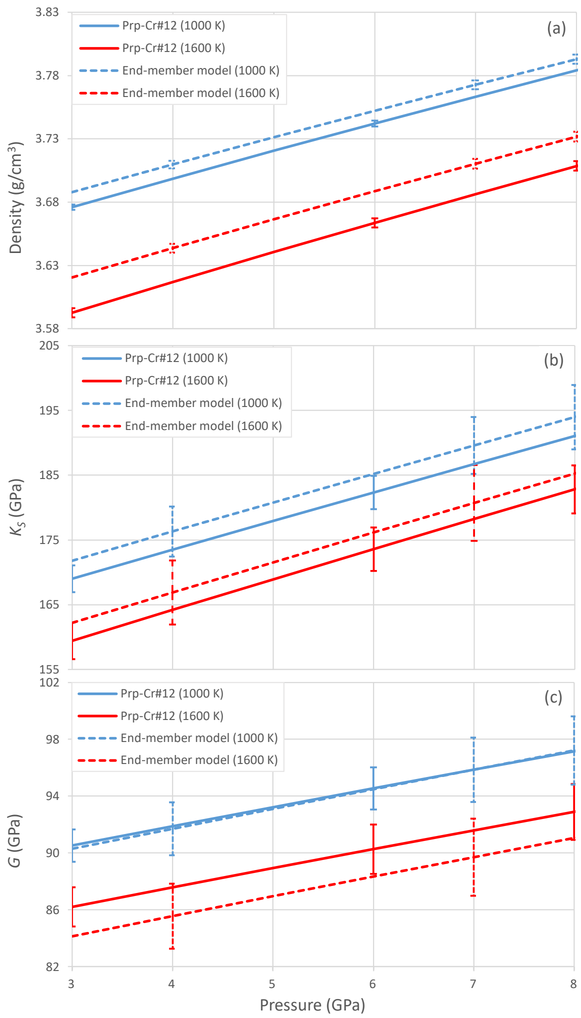

Figure S4. Density ρ (a), bulk modulus K_S (b) and shear modulus G (c) of Prp-Cr#12 along isotherms at 1000 K and 1600 K over 3-8 GPa. The solid curves represent values calculated using the elastic parameters (Table S3) fitted to the Prp-Cr#12 data. The dashed curves represent values calculated using the end-member model (linear average of garnet end-member parameters; Table S4) elastic parameters determined for the Prp-Cr#12 composition. Error bars are shown at selected pressures.

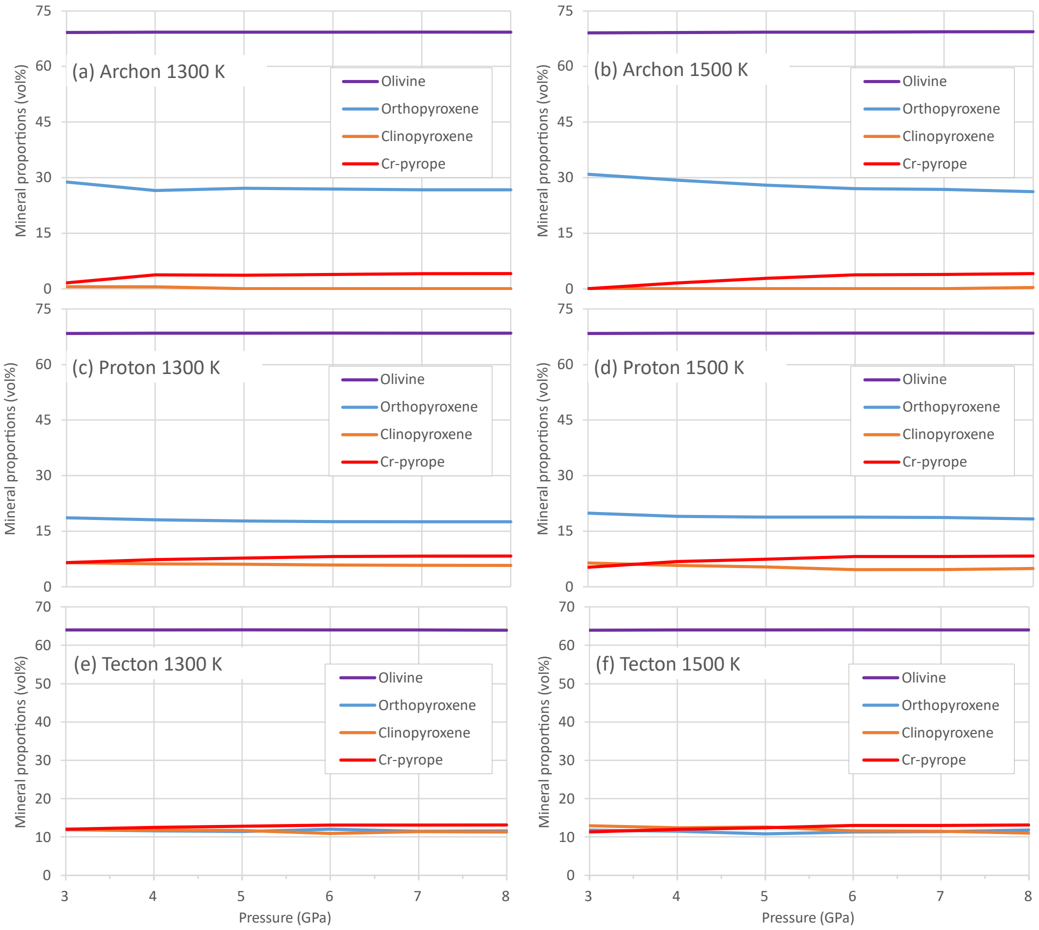

Figure S5. Calculated mineral proportions of three SCLMs, (a) Archon, (b) Proton, and (c) Tecton at 3-8 GPa along isotherms at 1300 K and 1500 K. The major-element compositions of the SCLMs are extracted from Griffin et al. (2009).

Table S1. Average compositions of the Archon, Proton, and Tecton SCLM adopted from Griffin et al. (2009), which are used for the Perple_X calculation

Oxide (wt.%)	Archon	Proton	Tecton
SiO_2	45.7	44.7	44.5
Al_2O_3	0.99	2.1	3.5
FeO	6.4	7.9	8.0
MgO	45.5	42.4	39.8
CaO	0.59	1.9	3.1
Na_2O	0.07	0.15	0.24
Cr_2O_3	0.28	0.42	0.40

Note: other minor components (e.g., TiO_2, MnO) are not considered in the Perple_X calculation.

Table S2. Mineral proportions and compositions of the Archon (a), Proton (b) and Tecton (c) as a function of pressure and temperature

Pressure (GPa)	Temperature (K)	Ol/Opx/Cpx/Gt (vol. %)	Ol		Opx		Cpx		Gt	
					(a) Archon					
3	835	69.1/25.8/1.9/3.2	$Mg_{1.85}Fe_{0.15}SiO_4$	$Fo_{92.75}$ $Fa_{7.25}$	$Mg_{1.84}Fe_{0.12}Ca_{0.01}Na_{0.01}Cr_{0.02}Al_{0.02}Si_{1.98}O_6$	$En_{90.71}Fs_{5.99}Di_{0.8}Kos_{0.8}Jd_0MgTs_{0.6}CrEn_{1.1}$	$Mg_{0.85}Fe_{0.03}Ca_{0.84}Na_{0.14}Cr_{0.08}Al_{0.06}Si_2O_6$	$Di_{80.7}Jd_6Hd_{3.2}Cen_{1.9}Kos_{8.2}CaTs_0$	$Mg_{2.09}Fe_{0.65}Ca_{0.26}Cr_{0.08}Al_{1.92}Si_3O_{12}$	$Prp_{69.8}Alm_{21.6}Grs_{4.8}Uvr_{3.8}Knr_0$
4	987	69.2/26/1.3/3.6	$Mg_{1.85}Fe_{0.15}Si$	$Fo_{92.60}$ $Fa_{7.40}$	$Mg_{1.84}Fe_{0.11}Ca_{0.02}Na_{0.01}Cr_{0.01}Al_{0.02}Si_{1.99}O_6$	$En_{90.51}Fs_{5.49}Di_{1.9}Kos_{1.2}Jd_0MgTs_{0.7}CrEn_{0.2}$	$Mg_{0.87}Fe_{0.03}Ca_{0.84}Na_{0.13}Cr_{0.07}Al_{0.06}Si_2O_6$	$Di_{80.82}Jd_{5.59}Hd_{3.4}Cen_3Kos_{7.19}CaTs_0$	$Mg_{2.11}Fe_{0.54}Ca_{0.35}Cr_{0.16}Al_{1.84}Si_3O_{12}$	$Prp_{70.3}Alm_{18.1}Grs_{3.5}Uvr_{8.1}Knr_0$
5	1123	69.2/26.5/0.7/3.6	$Mg_{1.85}Fe_{0.15}SiO_4$	$Fo_{92.50}$ $Fa_{7.50}$	$Mg_{1.83}Fe_{0.1}Ca_{0.03}Na_{0.02}Cr_{0.01}Al_{0.02}Si_{1.99}O_6$	$En_{88.11}Fs_{4.8}Di_{4.5}Kos_{1.1}Jd_{0.5}MgTs_1CrEn_0$	$Mg_{0.89}Fe_{0.03}Ca_{0.87}Na_{0.1}Cr_{0.06}Al_{0.04}Si_2O_6$	$Di_{84.02}Jd_{4.4}Hd_{3.1}Cen_{2.6}Kos_{5.89}CaTs_0$	$Mg_{2.1}Fe_{0.52}Ca_{0.38}Cr_{0.21}Al_{1.79}Si_3O_{12}$	$Prp_{69.8}Alm_{17.4}Grs_{2.1}Uvr_{10.7}Knr_0$
6	1242	69.2/26.8/0.5/3.5	$Mg_{1.85}Fe_{0.15}SiO_4$	$Fo_{92.30}$ $Fa_{7.70}$	$Mg_{1.82}Fe_{0.1}Ca_{0.05}Na_{0.02}Cr_{0.01}Al_{0.03}Si_{1.99}O_6$	$En_{88.91}Fs_{4.6}Di_{4.7}Kos_{0.7}Jd_{1.1}MgTs_0CrEn_0$	$Mg_{0.93}Fe_{0.04}Ca_{0.84}Na_{0.1}Cr_{0.06}Al_{0.04}Si_2O_6$	$Di_{79.7}Jd_{4.2}Hd_4Cen_{6.5}Kos_{5.6}CaTs_0$	$Mg_{2.26}Fe_{0.44}Ca_{0.3}Cr_{0.24}Al_{1.76}Si_3O_{12}$	$Prp_{73.43}Alm_{14.59}Grs_0Uvr_{10.09}Knr_{1.9}$
7	1345	69.3/26.7/0/4	$Mg_{1.85}Fe_{0.15}SiO_4$	$Fo_{92.25}$ $Fa_{7.75}$	$Mg_{1.83}Fe_{0.09}Ca_{0.05}Na_{0.02}Cr_{0.01}Al_{0.01}Si_2O_6$	$En_{88.91}Fs_{4.4}Di_{4.9}Kos_{0.5}Jd_{1.3}MgTs_0CrEn_0$	-	-	$Mg_{2.18}Fe_{0.4}Ca_{0.42}Cr_{0.27}Al_{1.73}Si_3O_{12}$	$Prp_{72.6}Alm_{13.4}Grs_{0.3}Uvr_{13.7}Knr_0$
8	1431	69.3/26.7/0/4.1	$Mg_{1.84}Fe_{0.16}SiO_4$	$Fo_{92.20}$ $Fa_{7.80}$	$Mg_{1.83}Fe_{0.09}Ca_{0.05}Na_{0.02}Cr_{0.01}Al_{0.01}Si_2O_6$	$En_{89.2}Fs_{5.2}Di_{3.2}Kos_{1.2}Jd_{0.3}MgTs_{0.9}CrEn_0$	-	-	$Mg_{2.22}Fe_{0.4}Ca_{0.38}Cr_{0.29}Al_{1.71}Si_3O_{12}$	$Prp_{72.4}Alm_{13.2}Grs_0Uvr_{12.8}Knr_{1.6}$
					(b) Proton					
3	1032	68.4/17.4/6.9/7.3	$Mg_{1.81}Fe_{0.19}SiO_4$	$Fo_{90.7}$ $Fa_{9.3}$	$Mg_{1.79}Fe_{0.14}Ca_{0.02}Na_{0.01}Cr_{0.02}Al_{0.04}Si_{1.97}O_6$	$En_{87}Fs_{7.2}Di_{2.1}Kos_{1.1}Jd_0MgTs_{1.5}CrEn_{1.1}$	$Mg_{0.87}Fe_{0.05}Ca_{0.83}Na_{0.12}Cr_{0.06}Al_{0.06}Si_2O_6$	$Di_{77.5}Jd_{6.3}Hd_{5.2}Cen_{4.9}Kos_{6.1}CaTs_0$	$Mg_{2.1}Fe_{0.57}Ca_{0.33}Cr_{0.1}Al_{1.91}Si_3O_{12}$	$Prp_{70.03}Alm_{18.98}Grs_{6.19}Uvr_{4.8}Knr_0$
4	1238	68.4/17.7/6.3/7.5	$Mg_{1.81}Fe_{0.19}SiO_4$	$Fo_{90.5}$ $Fa_{9.5}$	$Mg_{1.77}Fe_{0.13}Ca_{0.04}Na_{0.02}Cr_{0.02}Al_{0.04}Si_{1.98}O_6$	$En_{85.31}Fs_{6.69}Di_{4.3}Kos_{1.5}Jd_{0.2}MgTs_2CrEn_0$	$Mg_{0.92}Fe_{0.06}Ca_{0.78}Na_{0.12}Cr_{0.04}Al_{0.08}Si_2O_6$	$Di_{72}Jd_{7.7}Hd_{6.1}Cen_{10}Kos_{4.2}CaTs_0$	$Mg_{2.12}Fe_{0.49}Ca_{0.4}Cr_{0.16}Al_{1.84}Si_3O_{12}$	$Prp_{70.53}Alm_{16.28}Grs_{5.29}Uvr_{7.89}Knr_0$
5	1425	68.5/18.1/5.7/7.7	$Mg_{1.81}Fe_{0.19}SiO_4$	$Fo_{90.35}$ $Fa_{9.65}$	$Mg_{1.75}Fe_{0.13}Ca_{0.07}Na_{0.02}Cr_{0.01}Al_{0.04}Si_{1.99}O_6$	$En_{83.22}Fs_{6.29}Di_{6.79}Kos_{1.2}Jd_{1.1}MgTs_{1.4}CrEn_0$	$Mg_{0.98}Fe_{0.07}Ca_{0.73}Na_{0.11}Cr_{0.03}Al_{0.08}Si_2O_6$	$Di_{66.23}Jd_{7.89}Hd_{6.89}Cen_{15.68}Kos_{3.2}CaTs_{0.1}$	$Mg_{2.14}Fe_{0.43}Ca_{0.43}Cr_{0.19}Al_{1.81}Si_3O_{12}$	$Prp_{71.2}Alm_{14.5}Grs_{4.9}Uvr_{9.4}Knr_0$
6	1592	68.5/19.5/3.9/8.1	$Mg_{1.8}Fe_{0.2}SiO_4$	$Fo_{90.24}$ $Fa_{9.76}$	$Mg_{1.73}Fe_{0.11}Ca_{0.09}Na_{0.03}Cr_{0.01}Al_{0.03}Si_2O_6$	$En_{81.42}Fs_{5.69}Di_{9.39}Kos_{0.8}Jd_{2.2}MgTs_{0.5}CrEn_0$	$Mg_{1.03}Fe_{0.07}Ca_{0.67}Na_{0.12}Cr_{0.03}Al_{0.09}Si_2O_6$	$Di_{60.14}Jd_{8.99}Hd_{7.09}Cen_{21.28}Kos_{2.5}CaTs_0$	$Mg_2Fe_{0.39}Ca_{0.61}Cr_{0.21}Al_{1.79}Si_3O_{12}$	$Prp_{66.7}Alm_{13.1}Grs_{9.6}Uvr_{10.6}Knr_0$
					(c) Tecton					
3	1270	64.0/11.9/12.0/12.1	$Mg_{1.8}Fe_{0.2}SiO_4$	$Fo_{89.99}$ $Fa_{10.01}$	$Mg_{1.74}Fe_{0.14}Ca_{0.05}Na_{0.02}Cr_{0.02}Al_{0.08}Si_{1.96}O_6$	$En_{82.42}Fs_{7.19}Di_{4.9}Kos_{1.6}Jd_0MgTs_{3.7}CrEn_{0.2}$	$Mg_{0.93}Fe_{0.07}Ca_{0.76}Na_{0.13}Cr_{0.03}Al_{0.1}Si_2O_6$	$Di_{69.23}Jd_{9.89}Hd_{6.49}Cen_{11.69}Kos_{2.7}CaTs_0$	$Mg_{2.19}Fe_{0.46}Ca_{0.35}Cr_{0.09}Al_{1.91}Si_3O_{12}$	$Prp_{73.1}Alm_{15.2}Grs_{7.1}Uvr_{4.6}Knr_0$
4	1538	64.0/11.0/13.0/12.0	$Mg_{1.8}Fe_{0.2}SiO_4$	$Fo_{89.89}$ $Fa_{10.11}$	$Mg_{1.7}Fe_{0.14}Ca_{0.08}Na_{0.02}Cr_{0.01}Al_{0.09}Si_{1.96}O_6$	$En_{78.7}Fs_{6.9}Di_{8.3}Kos_{1.2}Jd_{0.9}MgTs_4CrEn_0$	$Mg_{1.05}Fe_{0.09}Ca_{0.63}Na_{0.11}Cr_{0.02}Al_{0.11}Si_{1.99}O_6$	$Di_{52.8}Jd_{9.2}Hd_{9.1}Cen_{26}Kos_2CaTs_{0.9}$	$Mg_{2.18}Fe_{0.41}Ca_{0.41}Cr_{0.11}Al_{1.89}Si_3O_{12}$	$Prp_{72.7}Alm_{13.5}Grs_{8.1}Uvr_{5.7}Knr_0$
4.5	1664	64.0/7.0/17.9/11.1	$Mg_{1.8}Fe_{0.2}SiO_4$	$Fo_{89.83}$ $Fa_{10.17}$	$Mg_{1.71}Fe_{0.13}Ca_{0.09}Na_{0.03}Cr_{0.01}Al_{0.05}Si_{1.99}O_6$	$En_{80.12}Fs_{6.39}Di_{9.39}Kos_{0.7}Jd_{2.1}MgTs_{1.3}CrEn_0$	$Mg_{1.2}Fe_{0.11}Ca_{0.47}Na_{0.08}Cr_{0.02}Al_{0.17}Si_{1.95}O_6$	$Di_{29.9}Jd_{6.5}Hd_{11.2}Cen_{45.3}Kos_{1.7}CaTs_{5.4}$	$Mg_{2.19}Fe_{0.39}Ca_{0.43}Cr_{0.13}Al_{1.87}Si_3O_{12}$	$Prp_{72.83}Alm_{12.99}Grs_{7.79}Uvr_{6.39}Knr_0$
5	1787	64.1/7.0/17.1/11.9	$Mg_{1.8}Fe_{0.2}SiO_4$	$Fo_{89.77}$ $Fa_{10.23}$	$Mg_{1.67}Fe_{0.13}Ca_{0.12}Na_{0.03}Cr_{0.01}Al_{0.08}Si_{1.97}O_6$	$En_{75.62}Fs_{6.29}Di_{12.39}Kos_{0.8}Jd_{1.8}MgTs_{3.1}CrEn_0$	$Mg_{1.24}Fe_{0.11}Ca_{0.45}Na_{0.09}Cr_{0.01}Al_{0.13}Si_{1.98}O_6$	$Di_{31.8}Jd_{7.6}Hd_{11}Cen_{46.1}Kos_{1.1}CaTs_{2.4}$	$Mg_{2.19}Fe_{0.37}Ca_{0.44}Cr_{0.14}Al_{1.86}Si_3O_{12}$	$Prp_{73}Alm_{12.2}Grs_8Uvr_{6.8}Knr_0$

Notes: Ol-olivine; Opx-orthopyroxene; Cpx-clinopyroxene; Gt-garnet; Fo-Forsterite (Mg_2SiO_4); Fa-fayalite (Fe_2SiO_4); En-enstatite ($Mg_2Si_2O_6$); Fs-Ferrosilite ($Fe_2Si_2O_6$); MgTs-Mg-tschermakite ($MgAlSiAlO_6$); Di-diopside ($CaMgSi_2O_6$); Jd-jadeite ($NaAlSi_2O_6$); Kos-kosmochlor ($NaCrSi_2O_6$); CrEn-Cr-enstatite ($MgCrSiAlO_6$); Hd-hedenbergite ($CaFeSi_2O_6$); Cen-clinoenstatite ($Mg_2Si_2O_6$); CaTs-Ca-tschermakite ($CaAlSiAlO_6$); Prp-pyrope ($Mg_3Al_2Si_3O_{12}$); Alm-Almandine ($Fe_3Al_2Si_3O_{12}$); Grs-grossular ($Ca_3Al_2Si_3O_{12}$); Uvr-uvarovite ($Ca_3Cr_2Si_3O_{12}$); Knr-knorringite ($Mg_3Cr_2Si_3O_{12}$). - means unavailable. The geotherms of Archon, Proton, and Tecton are adopted from Deen et al. (2006)

Table S3. Chemical Composition of the Cr-pyrope in this study

Oxide (wt.%)	Prp-Cr#12
SiO_2	41.77(58)
TiO_2	0.09(3)
Al_2O_3	19.91(23)
FeO[a]	6.39(4)
MnO	0.33(3)
MgO	20.15(24)
CaO	6.18(4)
Na_2O	0.01(1)
K_2O	0.00(0)
Cr_2O_3	4.33(6)
NiO	0.01(2)
Total	99.20(100)

Numbers in parenthesis represent standard deviations

[a] All Fe as FeO

Table S4. Elastic properties of Cr-pyrope and end-member pyrope

Composition	C_{11} (GPa)	C_{12} (GPa)	C_{44} (GPa)	K_{S0} (GPa)	G_0 (GPa)	V_P (km/s)	V_S (km/s)	$(\partial K_S/\partial P)_T$	$(\partial G/\partial P)_T$	$(\partial K_S/\partial T)_P$ (GPa/K)	$(\partial G/\partial T)_P$ (GPa/K)	Method	References
Cr-Prp[a]	291.4(6)	105.9(4)	90.6(3)	167.7(8)	91.5(5)	8.85(1)	4.97(1)	4.3(1)	1.4(1)	–0.0175(1)	–0.0073(1)		This study
Cr-Prp[b]	-	-	-	171.6(13)	90.7(1)	8.92(3)	4.99(1)	-	-	-	-	RPR	Babuška et al. (1978)
Cr-Prp[c]	-	-	-	171.3(16)	92.6(2)	8.92(4)	5.00(1)	-	-	-	-		
Cr-Prp[d]	-	-	-	170.0(18)	92.6(1)	8.90(5)	5.00(1)	-	-	-	-		
Cr-Prp[e]	-	-	-	170.8(27)	92.0(2)	8.88(7)	4.97(1)	-	-	-	-		
Cr-Prp[f]	296.6(15)	108.5(16)	91.6(2)	171.2(8)	92.6(3)	8.92	5.00			–0.0193(2)[g]	–0.0102(1)[g]	RPR	Suzuki & Anderson (1983)
Prp_{100}[h]	294.5(5)	105.7(6)	90.5(4)	168.6(4)	92.0(3)	9.05(1)	5.09(1)	4.6(1)	1.3(1)	–0.015(1)	–0.008(1)	BLS	Fan et al. (2019)
Prp_{100}[h]	296.2(5)	111.1(6)	91.6(3)	172.8(3)	92.0(2)	9.06	5.11	-	-	-	-	BLS	O'Neill et al. (1991)
Prp_{100}	295(2)	117(1)	90(3)	177(1)	89(1)	9.08	5.10	-	-	-	-	BLS	Leitner et al. (1980)
Prp_{100}	297(3)	108(2)	93(2)	171(2)	94(2)	9.115	5.125	4.1(3)	1.3(2)	-	-	BLS	Sinogeikin & Bass (2000)
Prp_{100}	298(3)	107(2)	93(2)	171(2)	94(2)	-	-	-	-	–0.014(2)	–0.009(1)	BLS	Sinogeikin & Bass (2002)
Prp_{100}	-	-	-	170(2)	93(1)	9.10(5)	5.12(3)	4.3(3)	1.5(2)	-	-	UI	Gwanmesia et al. (2006)
Prp_{100}	-	-	-	166.0(2)	92.2(1)	9.01	5.09	-	-	–0.0193(4)	–0.0104(2)	UI	Gwanmesia et al. (2007)
Prp_{100}	-	-	-	171(2)	92(1)	9.07(5)	5.07(3)	5.3(4)	1.6(2)	-	-	UI	Chen et al. (1999)
Prp_{100}	-	-	-	172.0(16)	89.1(5)	-	-	4.38(8)	1.66(5)	–0.018(2)	–0.008(1)	UI	Chantel et al. (2016)
Prp_{100}	-	-	-	170.0(2)	93.2(1)	-	-	4.51(2)	1.51(2)	–0.0170(1)	–0.0107(1)	UI	Zou, Irifune, et al. (2012)

Notes:

[a] $Prp_{71.0}Alm_{12.6}Sps_{0.7}Grs_{3.5}Uvr_{12.2}$,

[b] $Prp_{73.1}Alm_{14.3}Adr_{3.1}Sps_{0.6}Uvr_{8.9}$,

[c] $Prp_{72.6}Alm_{15.7}Grs_{0.6}Adr_{4.3}Sps_{0.7}Uvr_{6.1}$,

[d] $Prp_{72.6}Alm_{16.0}Grs_{1.9}Adr_{4.2}Sps_{0.6}Uvr_{4.7}$,

[e] $Prp_{70.4}Alm_{16.0}Grs_{1.8}Adr_{2.1}Sps_{0.9}Uvr_{8.8}$,

[f] $Prp_{72.6}Alm_{15.7}Grs_{0.6}Adr_{4.3}Sps_{0.7}Uvr_{6.1}$,

[g] $Prp_{68}Alm_{24}Grs_{5}Sps_{1}$;

[g] - refit the literature data by this study;

[h] - Hydrous sample

Prp - pyrope; Alm - Almandine; Grs - grossular; Sps - spessartine; Uvr - uvarovite; Adr - andradite; BLS = Brillouin light scattering; UI = ultrasonic interferometry; RPR = rectangular parallelepiped resonance. - means unavailable

Table S5. Elastic parameters of minerals used for density and velocity calculations

Formula	ρ (g/cm^3)	K_{S0} (GPa)	$(\partial K_S/\partial P)_T$	$(\partial^2 K_S/\partial P^2)_T$	$\partial K_S/\partial T$ (GPaK^{-1})	G_0 (GPa)	$(\partial G/\partial P)_T$	$(\partial^2 G/\partial P^2)_T$	$\partial G/\partial T$ (GPaK^{-1})	γ	α (10^{-5} K^{-1})	θ_E (K)	ReFerences
Prp_{100} ($Mg_3Al_2Si_3O_{12}$)	3.565(3)	171(1)	4.3(2)	-	−0.016(1)	92.3(9)	1.5(1)	-	−0.0092(7)	1.15	2.543(5)	320	1
Alm_{100} ($Fe_3Al_2Si_3O_{12}$)	4.3188(2)	174(1)	4.6(1)	-	−0.0267(7)	94.9(7)	1.06(6)	-	−0.0131(8)	1.22	1.85(1)	600	2
Grs_{100} ($Ca_3Al_2Si_3O_{12}$)	3.5949(1)	168.4(7)	4.9(1)	-	−0.0136(5)	108.9(4)	1.39(4)	-	−0.0128(2)	1.22	2.09(2)	512	3
Uvr_{100} ($Ca_3Cr_2Si_3O_{12}$)	3.8302(7)	162(2)	4.7(9)	-	−0.012(3)	92(1)	1.8(5)	-	−0.0128(2)	1.22	1.64(14)	473	4
Knr_{100} ($Mg_3Cr_2Si_3O_{12}$)	3.8930(8)	160(2)	4.6(9)	-	−0.012(3)	92(1)	1.8(5)	-	−0.0128(2)	1.34	2.89(6)	477	5
Fo_{100} (Mg_2SiO4)	3.2214(2)	129.8(9)	4.45(5)	-	−0.018(2)	77.8(5)	1.8(1)	−0.10(2)	−0.013(1)	1.14	2.666(9)	484	6
Fa_{100} (Fe_2SiO4)	4.4020(7)	129.8(9)	4.45(5)	-	−0.018(2)	77.8(5)	1.8(1)	−0.10(2)	−0.013(1)	1.14	2.666(9)	484	7
En_{100} ($Mg_2Si_2O_6$)	3.2039(2)	113(1)	8.8(1)	−0.68(6)	−0.0263(3)	75.9(7)	2.9(1)	−0.40(2)	−0.0136(3)	0.88	2.591(18)	510	8
Fs_{100} ($Fe_2Si_2O_6$)	3.9985(3)	113(1)	8.8(1)	−0.68(6)	−0.0263(3)	75.9(7)	2.9(1)	−0.40(2)	−0.0136(3)	0.89	2.591(18)	510	9
$MgTs_{100}$ ($MgAlSiAlO_6$)	3.4153(5)	113(1)	8.8(1)	−0.68(6)	−0.0263(3)	75.9(7)	2.9(1)	−0.40(2)	−0.0136(3)	0.88	2.591(18)	510	10
$CrEn_{100}$ ($MgCrAlSiO_6$)	3.679(2)	113(1)	8.8(1)	−0.68(6)	−0.0263(3)	75.9(7)	2.9(1)	−0.40(2)	−0.0136(3)	0.88	2.591(18)	510	11
Jd_{100} ($NaAlSi_2O_6$)	3.3287(7)	138(3)	3.9(1)	-	−0.012(1)	84(2)	1.09(4)	-	−0.011(1)	1.06	2.67(7)	343	12
Di_{100} ($CaMgSi_2O_6$)	3.2787(4)	114.6(7)	5.4(4)	−0.2(1)	−0.012(1)	72.7(4)	1.9(2)	−0.07(4)	−0.011(1)	1.1	2.67(7)	343	13
Hd_{100} ($CaFeSi_2O_6$)	3.6625(6)	116.6(8)	5.0(2)	−0.12(4)	−0.012(1)	69.8(7)	1.72(9)	−0.05(2)	−0.011(1)	1.1	2.67(7)	343	14
Kos_{100} (NaCrSi2O6)	3.592(2)	138(3)	3.9(1)	-	−0.012(1)	84(2)	1.09(4)	-	−0.011(1)	1.06	2.67(7)	343	15
Cen_{100} ($Mg_2Si_2O_6$)	3.2077(6)	114.6(7)	5.4(4)	−0.2(1)	−0.012(1)	72.7(4)	1.9(2)	−0.07(4)	−0.011(1)	1.1	2.67(7)	343	16
$CaTs_{100}$ ($CaAl_2SiO_6$)	3.45	114.6(7)	5.4(4)	−0.2(1)	−0.012(1)	72.7(4)	1.9(2)	−0.07(4)	−0.011(1)	1.1	2.67(7)	343	17

Note: Due to the lack of end-member elastic parameters, $\partial K_S/\partial T$ of Uvr_{100} is converted from $\partial K_T/\partial T$ obtained from Gréaux & Yamada (2019); $\partial G/\partial T$ of Uvr_{100} is assumed to be equal to that of Grs_{100}; G_0, $(\partial G/\partial P)_T$ and $\partial G/\partial T$ of Knr_{100} are assumed to be equal to that of Uvr_{100}, while $\partial K_S/\partial T$ and K_{S0} of Knr100 are converted from $\partial K_T/\partial T$ and K_{T0}, respectively ; the elastic parameters except density of San Carlos olivine (Angel et al., 2018; Mao et al., 2015; Zhang & Bass, 2016b) are used For Fo_{100} and Fa_{100}; the elastic parameters K_{S0}, $(\partial K_S/\partial P)_T$, $(\partial^2 K_S/\partial P^2)_T$, G_0 (GPa), $(\partial G/\partial P)_T$, and $(\partial^2 G/\partial P^2)_T$ of San Carlos orthopyroxene (Zhang & Bass, 2016a), $\partial K_S/\partial T$ and $\partial G/\partial T$ of En_{100} (Jackson et al., 2007), α of Ca-, Fe-, Al-bearing orthopyroxene (Faccincani et al., 2021) are used for En_{100}, Fs_{100}, $CrEn_{100}$ and $MgTs_{100}$; γ of En_{100} is used For En_{100}, $CrEn_{100}$ and $MgTs_{100}$; the density of $MgTs_{100}$ is Calculated using a linear interpolation of the densities of En_{100}, Fs_{100} and synthetic MgTs-rich orthopyroxene (Xu et al., 2020; Xu et al., 2022), while the density of CrEn is calculated using ρ ($CrEn_{100}$)= ρ (Kos_{100})+ ρ ($MgTs_{100}$) – ρ (Jd_{100}); the elastic parameters K_{S0}, $(\partial K_S/\partial P)_T$, $(\partial^2 K_S/\partial P^2)_T$, G_0 (GPa), $(\partial G/\partial P)_T$, $(\partial^2 G/\partial P^2)_T$, $\partial K_S/\partial T$, $\partial G/\partial T$ and γ of diopside (Jeanloz & Thompson, 1983; Li & Neuville, 2010; Sang & Bass, 2014; Zhao et al., 1998) are used For Di_{100}, Cen_{100} and $CaTs_{100}$; the elastic parameters K_{S0}, $(\partial K_S/\partial P)_T$, G_0 (GPa), $(\partial G/\partial P)_T$ and γ of Jadeite (Hao et al., 2020), $\partial K_S/\partial T$ and $\partial G/\partial T$ of diopside (Li & Neuville, 2010) are used For Jd_{100} and Kos_{100}; the elastic parameters K_{S0}, $(\partial K_S/\partial P)_T$, $(\partial^2 K_S/\partial P^2)_T$, G_0 (GPa), $(\partial G/\partial P)_T$, $(\partial^2 G/\partial P^2)_T$ of Fe-rich diopside (Fan et al., 2020), $\partial K_S/\partial T$, $\partial G/\partial T$ and γ of diopside are used For Hd_{100}. α of clinopyroxene (Faccincani et al., 2021) is used For All end-member clinopyroxenes. Fo-Forsterite; Fa-fayalite; En-enstatite; Fs-Ferrosilite; MgTs-Mg-tschermakite; Di-diopside; Jd-jadeite; Kos-kosmochlor; CrEn-Cr-enstatite; Hd-hedenbergite; Cen-clinoenstatite; CaTs-Ca-tschermakite; Prp-pyrope; Alm-Almandine; Grs-grossular; Uvr-uvarovite; Knr-knorringite. - means unavailable.

References: 1-(Chantel et al., 2016; Gwanmesia et al., 2006; Milani et al., 2015; Sinogeikin & Bass, 2000; Sinogeikin & Bass, 2002; Zhang et al., 1998; Zou, Gréaux, et al., 2012); 2-(Arimoto et al., 2015; Milani et al., 2015; Soga, 1967); 3-(Bass, 1989; Gwanmesia et al., 2014; Isaak et al., 1992; Milani et al., 2017); 4-(Bass, 1986; Gréaux & Yamada, 2019; Klemme et al., 2005; Wang & Ji, 2001); 5-(Bass, 1986; Dymshits et al., 2014; Gréaux & Yamada, 2019; Klemme et al., 2005; Wang & Ji, 2001); 6-(Angel et al., 2018; Kroll et al., 2012; Mao et al., 2015; Zhang & Bass, 2016b); 7-(Angel et al., 2018; Kroll et al., 2012; Mao et al., 2015; Zhang & Bass, 2016b); 8-(Faccincani et al., 2021; Jackson et al., 2007; Xu et al., 2018; Yang & Ghose, 1994; Zhang & Bass, 2016a); 9-(Faccincani et al., 2021; Hugh-Jones, 1997; Jackson et al., 2007; Xu et al., 2020; Yang & Ghose, 1994; Zhang & Bass, 2016a); 10-(Faccincani et al., 2021; Jackson et al., 2007; Xu et al., 2022; Yang & Ghose, 1994; Zhang & Bass, 2016a); 11-(Faccincani et al., 2021; Jackson et al., 2007; Ohashi, 1984; Yang & Ghose, 1994; Zhang & Bass, 2016a); 12-(Hao et al., 2020; Li & Neuville, 2010; Zhao et al., 1997); 13- (Jeanloz & Thompson, 1983; Li & Neuville, 2010; Sang & Bass, 2014; Zhao et al., 1998); 14-(Fan et al., 2020; Jeanloz & Thompson, 1983; Li & Neuville, 2010; Tribaudino et al., 2008); 15- (Cameron et al., 1973; Hao et al., 2020; Li & Neuville, 2010); 16-(Hugh-Jones, 1997; Jacobsen et al., 2010; Jeanloz & Thompson, 1983; Li & Neuville, 2010; Sang & Bass, 2014); 17-(Jeanloz & Thompson, 1983; Li & Neuville, 2010; Ma et al., 2009; Sang & Bass, 2014; Zhao et al., 1998)

Table S6. Mineral proportions and compositions of the Archon (a), Proton (b) and Tecton (c) as a function of pressure and temperature

Pressure (GPa)	Temperature (K)	Ol/Opx/Cpx/Gt (vol%)	Ol		Opx		Cpx		Gt	
(a) Archon										
3	1300	69.1/28.8/0.5/1.6	$Mg_{1.85}Fe_{0.15}SiO_4$	$Fo_{92.4}Fa_{7.6}$	$Mg_{1.76}Fe_{0.11}Ca_{0.05}Na_{0.01}Cr_{0.02}Al_{0.08}Si_{1.95}O_6$	$En_{83.42}Fs_{5.69}Di_{4.9}Kos_{1.4}Jd_0MgTs_{3.8}CrEn_{0.8}$	$Mg_{0.94}Fe_{0.06}Ca_{0.75}Na_{0.13}Cr_{0.04}Al_{0.09}Si_2O_6$	$Di_{69.4}Jd_{8.6}Hd_{5.6}Cen_{12.1}Kos_{4.2}CaTs_{0.1}$	$Mg_{2.25}Fe_{0.36}Ca_{0.39}Cr_{0.13}Al_{1.87}Si_3O_{12}$	$Prp_{75.02}Alm_{12.09}Grs_{6.39}Uvr_{6.49}Knr_0$
4	1300	69.3/26.5/0.5/3.8	$Mg_{1.85}Fe_{0.15}SiO_4$	$Fo_{92.55}Fa_{7.45}$	$Mg_{1.84}Fe_{0.09}Ca_{0.03}Na_{0.02}Cr_{0.01}Al_{0.02}Si_{1.99}O_6$	$En_{90.21}Fs_{4.5}Di_{2.9}Kos_{0.8}Jd_1MgTs_{0.6}CrEn_0$	$Mg_1Fe_0Ca_{0.99}Na_{0.01}Cr_0Al_0Si_2O_6$	$Di_{98.5}Jd_{0.3}Hd_{0.3}Cen_{0.6}Kos_{0.3}CaTs_0$	$Mg_{1.78}Fe_{0.78}Ca_{0.44}Cr_{0.27}Al_{1.73}Si_3O_{12}$	$Prp_{59.3}Alm_{26}Grs_{1.1}Uvr_{13.6}Knr_0$
5	1300	69.2/27.1/0/3.6	$Mg_{1.85}Fe_{0.15}SiO_4$	$Fo_{92.35}Fa_{7.65}$	$Mg_{1.81}Fe_{0.1}Ca_{0.05}Na_{0.02}Cr_{0.01}Al_{0.02}Si_{1.99}O_6$	$En_{87.51}Fs_{5.09}Di_{4.8}Kos_{1.1}Jd_{0.6}MgTs_{0.9}CrEn_0$	-	-	$Mg_{2.17}Fe_{0.39}Ca_{0.43}Cr_{0.24}Al_{1.76}Si_3O_{12}$	$Prp_{72.4}Alm_{13.1}Grs_{2.7}Uvr_{11.8}Knr_0$
6	1300	69.3/26.9/0/3.9	$Mg_{1.85}Fe_{0.15}SiO_4$	$Fo_{92.3}Fa_{7.7}$	$Mg_{1.82}Fe_{0.1}Ca_{0.05}Na_{0.02}Cr_{0.01}Al_{0.02}Si_2O_6$	$En_{88.4}Fs_{4.8}Di_{4.7}Kos_{0.9}Jd_{0.8}MgTs_{0.4}CrEn_0$	-	-	$Mg_{2.16}Fe_{0.41}Ca_{0.43}Cr_{0.26}Al_{1.74}Si_3O_{12}$	$Prp_{72}Alm_{13.5}Grs_{1.7}Uvr_{12.8}Knr_0$
7	1300	69.3/26.7/0/4.1	$Mg_{1.85}Fe_{0.15}SiO_4$	$Fo_{92.3}Fa_{7.7}$	$Mg_{1.83}Fe_{0.09}Ca_{0.04}Na_{0.02}Cr_{0.01}Al_{0.01}Si_2O_6$	$En_{89.21}Fs_{4.6}Di_{4.4}Kos_{0.7}Jd_{1.1}MgTs_0CrEn_0$	-	-	$Mg_{2.13}Fe_{0.42}Ca_{0.45}Cr_{0.27}Al_{1.73}Si_3O_{12}$	$Prp_{71}Alm_{14}Grs_{1.6}Uvr_{13.4}Knr_0$
8	1300	69.3/26.7/0/4.1	$Mg_{1.85}Fe_{0.15}SiO_4$	$Fo_{92.25}Fa_{7.75}$	$Mg_{1.83}Fe_{0.09}Ca_{0.05}Na_{0.02}Cr_{0.01}Al_{0.01}Si_2O_6$	$En_{89.31}Fs_{4.4}Di_{4.5}Kos_{0.6}Jd_{1.2}MgTs_0CrEn_0$	-	-	$Mg_{2.12}Fe_{0.44}Ca_{0.45}Cr_{0.28}Al_{1.72}Si_3O_{12}$	$Prp_{70.6}Alm_{14.6}Grs_{0.9}Uvr_{13.9}Knr_0$
3	1500	69.1/30.9/0/0	$Mg_{1.85}Fe_{0.15}SiO_4$	$Fo_{92.34}Fa_{7.66}$	$Mg_{1.73}Fe_{0.11}Ca_{0.06}Na_{0.02}Cr_{0.03}Al_{0.13}Si_{1.93}O_6$	$En_{79.6}Fs_{5.6}Di_{6.3}Kos_{1.5}Jd_0MgTs_6CrEn_1$	-	-	-	-
4	1500	69.2/29.3/0/1.6	$Mg_{1.85}Fe_{0.15}SiO_4$	$Fo_{92.29}Fa_{7.71}$	$Mg_{1.76}Fe_{0.11}Ca_{0.06}Na_{0.02}Cr_{0.02}Al_{0.09}Si_{1.96}O_6$	$En_{82.7}Fs_{5.3}Di_{5.9}Kos_{1.6}Jd_0MgTs_{4.2}CrEn_{0.3}$	-	-	$Mg_{2.33}Fe_{0.34}Ca_{0.34}Cr_{0.25}Al_{1.75}Si_3O_{12}$	$Prp_{76.4}Alm_{11.2}Grs_0Uvr_{11.3}Knr_{1.1}$
5	1500	69.3/27.9/0/2.8	$Mg_{1.84}Fe_{0.16}SiO_4$	$Fo_{92.25}Fa_{7.75}$	$Mg_{1.79}Fe_{0.1}Ca_{0.06}Na_{0.02}Cr_{0.01}Al_{0.05}Si_{1.98}O_6$	$En_{85.31}Fs_{5.09}Di_{5.59}Kos_{1.3}Jd_{0.4}MgTs_{2.3}CrEn_0$	-	-	$Mg_{2.32}Fe_{0.34}Ca_{0.34}Cr_{0.26}Al_{1.74}Si_3O_{12}$	$Prp_{75.7}Alm_{11.4}Grs_0Uvr_{11.2}Knr_{1.7}$
6	1500	69.3/27/0/3.7	$Mg_{1.84}Fe_{0.16}SiO_4$	$Fo_{92.25}Fa_{7.75}$	$Mg_{1.81}Fe_{0.1}Ca_{0.05}Na_{0.02}Cr_{0.01}Al_{0.02}Si_{1.99}O_6$	$En_{87.6}Fs_{4.8}Di_{5.3}Kos_{0.8}Jd_{0.9}MgTs_{0.6}CrEn_0$	-	-	$Mg_{2.31}Fe_{0.35}Ca_{0.34}Cr_{0.28}Al_{1.72}Si_3O_{12}$	$Prp_{74.43}Alm_{11.69}Grs_0Uvr_{11.39}Knr_{2.5}$
7	1500	69.3/26.8/0/3.9	$Mg_{1.84}Fe_{0.16}SiO_4$	$Fo_{92.2}Fa_{7.8}$	$Mg_{1.82}Fe_{0.09}Ca_{0.05}Na_{0.02}Cr_{0.01}Al_{0.02}Si_2O_6$	$En_{88.2}Fs_{4.6}Di_{5.2}Kos_{0.6}Jd_{1.1}MgTs_{0.3}CrEn_0$	-	-	$Mg_{2.29}Fe_{0.36}Ca_{0.35}Cr_{0.29}Al_{1.71}Si_3O_{12}$	$Prp_{73.6}Alm_{12.1}Grs_0Uvr_{11.5}Knr_{2.8}$
8	1500	69.6/26.3/0/4.1	$Mg_{1.82}Fe_{0.18}SiO_4$	$Fo_{91.25}Fa_{8.75}$	$Mg_{1.93}Fe_{0.02}Ca_{0.02}Na_{0.02}Cr_0Al_{0.02}Si_2O_6$	$En_{95.4}Fs_{0.8}Di_2Kos_{0.2}Jd_{1.6}MgTs_0CrEn_0$	-	-	$Mg_{1.98}Fe_{0.44}Ca_{0.58}Cr_{0.33}Al_{1.67}Si_3O_{12}$	$Prp_{66.17}Alm_{14.51}Grs_3Uvr_{16.32}Knr_0$
(b) Proton										
3	1300	68.4/18.6/6.5/6.5	$Mg_{1.81}Fe_{0.19}SiO_4$	$Fo_{90.5}Fa_{9.5}$	$Mg_{1.73}Fe_{0.14}Ca_{0.05}Na_{0.01}Cr_{0.02}Al_{0.08}Si_{1.95}O_6$	$En_{81.62}Fs_{7.09}Di_{5.29}Kos_{1.4}Jd_0MgTs_{3.8}CrEn_{0.8}$	$Mg_{0.94}Fe_{0.07}Ca_{0.74}Na_{0.12}Cr_{0.04}Al_{0.09}Si_2O_6$	$Di_{67.03}Jd_{8.19}Hd_{6.99}Cen_{13.39}Kos_{4.1}CaTs_{0.3}$	$Mg_{2.15}Fe_{0.45}Ca_{0.4}Cr_{0.14}Al_{1.86}Si_3O_{12}$	$Prp_{71.67}Alm_{15.02}Grs_{6.41}Uvr_{6.91}Knr_0$
4	1300	68.4/18.1/6.2/7.3	$Mg_{1.81}Fe_{0.19}SiO_4$	$Fo_{90.5}Fa_{9.5}$	$Mg_{1.75}Fe_{0.13}Ca_{0.05}Na_{0.02}Cr_{0.02}Al_{0.05}Si_{1.98}O_6$	$En_{83.9}Fs_{6.6}Di_{5.2}Kos_{1.5}Jd_{0.3}MgTs_{2.5}CrEn_0$	$Mg_{0.94}Fe_{0.07}Ca_{0.76}Na_{0.12}Cr_{0.04}Al_{0.08}Si_2O_6$	$Di_{69.03}Jd_{7.49}Hd_{6.59}Cen_{12.59}Kos_{4.1}CaTs_{0.2}$	$Mg_{2.12}Fe_{0.47}Ca_{0.4}Cr_{0.16}Al_{1.84}Si_3O_{12}$	$Prp_{70.8}Alm_{15.7}Grs_{5.3}Uvr_{8.2}Knr_0$
5	1300	68.4/17.7/6.1/7.7	$Mg_{1.81}Fe_{0.19}SiO_4$	$Fo_{90.45}Fa_{9.55}$	$Mg_{1.77}Fe_{0.13}Ca_{0.05}Na_{0.02}Cr_{0.01}Al_{0.04}Si_{1.99}O_6$	$En_{85.21}Fs_{6.29}Di_{5.09}Kos_{1.2}Jd_{0.8}MgTs_{1.4}CrEn_0$	$Mg_{0.94}Fe_{0.06}Ca_{0.77}Na_{0.11}Cr_{0.04}Al_{0.08}Si_2O_6$	$Di_{70.7}Jd_{7.6}Hd_{6.1}Cen_{11.7}Kos_{3.8}CaTs_{0.1}$	$Mg_{2.11}Fe_{0.49}Ca_{0.4}Cr_{0.18}Al_{1.83}Si_3O_{12}$	$Prp_{70.3}Alm_{16.3}Grs_{4.6}Uvr_{8.8}Knr_0$
6	1300	68.5/17.5/5.9/8.1	$Mg_{1.81}Fe_{0.19}SiO_4$	$Fo_{90.45}Fa_{9.55}$	$Mg_{1.78}Fe_{0.12}Ca_{0.05}Na_{0.02}Cr_{0.01}Al_{0.02}Si_2O_6$	$En_{86.51}Fs_{5.89}Di_5Kos_{0.8}Jd_{1.5}MgTs_{0.3}CrEn_0$	$Mg_{0.94}Fe_{0.06}Ca_{0.79}Na_{0.11}Cr_{0.04}Al_{0.08}Si_2O_6$	$Di_{72.9}Jd_{7.5}Hd_{5.6}Cen_{10.4}Kos_{3.6}CaTs_0$	$Mg_{2.09}Fe_{0.5}Ca_{0.41}Cr_{0.19}Al_{1.81}Si_3O_{12}$	$Prp_{69.53}Alm_{16.78}Grs_{4.3}Uvr_{9.39}Knr_0$
7	1300	68.4/17.5/5.8/8.2	$Mg_{1.81}Fe_{0.19}SiO_4$	$Fo_{90.4}Fa_{9.6}$	$Mg_{1.79}Fe_{0.11}Ca_{0.05}Na_{0.02}Cr_{0.01}Al_{0.02}Si_2O_6$	$En_{87.11}Fs_{5.69}Di_{4.9}Kos_{0.7}Jd_{1.6}MgTs_0CrEn_0$	$Mg_{0.93}Fe_{0.05}Ca_{0.8}Na_{0.11}Cr_{0.03}Al_{0.08}Si_2O_6$	$Di_{74.6}Jd_{7.6}Hd_{5.2}Cen_{9.2}Kos_{3.4}CaTs_0$	$Mg_{2.07}Fe_{0.51}Ca_{0.42}Cr_{0.19}Al_{1.81}Si_3O_{12}$	$Prp_{68.9}Alm_{17.1}Grs_{4.3}Uvr_{9.7}Knr_0$
8	1300	68.4/17.5/5.8/8.3	$Mg_{1.81}Fe_{0.19}SiO_4$	$Fo_{90.4}Fa_{9.6}$	$Mg_{1.8}Fe_{0.11}Ca_{0.05}Na_{0.02}Cr_{0.01}Al_{0.02}Si_2O_6$	$En_{87.5}Fs_{5.4}Di_{4.8}Kos_{0.6}Jd_{1.7}MgTs_0CrEn_0$	$Mg_{0.93}Fe_{0.05}Ca_{0.8}Na_{0.11}Cr_{0.03}Al_{0.08}Si_2O_6$	$Di_{75.22}Jd_{7.99}Hd_{4.9}Cen_{8.69}Kos_{3.2}CaTs_0$	$Mg_{2.05}Fe_{0.53}Ca_{0.42}Cr_{0.2}Al_{1.8}Si_3O_{12}$	$Prp_{68.3}Alm_{17.8}Grs_{3.9}Uvr_{10}Knr_0$
3	1500	68.4/19.9/6.4/5.3	$Mg_{1.81}Fe_{0.19}SiO_4$	$Fo_{90.39}Fa_{9.61}$	$Mg_{1.68}Fe_{0.14}Ca_{0.08}Na_{0.02}Cr_{0.03}Al_{0.13}Si_{1.93}O_6$	$En_{76.22}Fs_{6.99}Di_{8.09}Kos_{1.6}Jd_0MgTs_{6.19}CrEn_{0.9}$	$Mg_{1.02}Fe_{0.09}Ca_{0.64}Na_{0.11}Cr_{0.03}Al_{0.12}Si_{1.98}O_6$	$Di_{53.6}Jd_8Hd_{8.8}Cen_{24.2}Kos_{3.4}CaTs_2$	$Mg_{2.19}Fe_{0.39}Ca_{0.42}Cr_{0.15}Al_{1.85}Si_3O_{12}$	$Prp_{72.87}Alm_{13.01}Grs_{6.41}Uvr_{7.71}Knr_0$
4	1500	68.4/19/5.8/6.8	$Mg_{1.81}Fe_{0.19}SiO_4$	$Fo_{90.34}Fa_{9.66}$	$Mg_{1.71}Fe_{0.13}Ca_{0.08}Na_{0.02}Cr_{0.02}Al_{0.08}Si_{1.96}O_6$	$En_{79.6}Fs_{6.6}Di_8Kos_{1.8}Jd_{0.2}MgTs_{3.8}CrEn_0$	$Mg_{1.01}Fe_{0.08}Ca_{0.68}Na_{0.11}Cr_{0.03}Al_{0.09}Si_2O_6$	$Di_{59.8}Jd_{8.2}Hd_8Cen_{20.4}Kos_{3.2}CaTs_{0.4}$	$Mg_{2.17}Fe_{0.4}Ca_{0.44}Cr_{0.18}Al_{1.82}Si_3O_{12}$	$Prp_{72.13}Alm_{13.29}Grs_{5.69}Uvr_{8.89}Knr_0$
5	1500	68.5/18.8/5.4/7.4	$Mg_{1.81}Fe_{0.19}SiO_4$	$Fo_{90.34}Fa_{9.66}$	$Mg_{1.73}Fe_{0.12}Ca_{0.08}Na_{0.02}Cr_{0.01}Al_{0.06}Si_{1.98}O_6$	$En_{81.12}Fs_{6.19}Di_{8.09}Kos_{1.3}Jd_{1.1}MgTs_{2.2}CrEn_0$	$Mg_{1.01}Fe_{0.08}Ca_{0.69}Na_{0.11}Cr_{0.03}Al_{0.09}Si_2O_6$	$Di_{60.7}Jd_{8.1}Hd_{7.5}Cen_{20.3}Kos_3CaTs_{0.4}$	$Mg_{2.11}Fe_{0.42}Ca_{0.47}Cr_{0.19}Al_{1.81}Si_3O_{12}$	$Prp_{70.3}Alm_{14}Grs_6Uvr_{9.7}Knr_0$
6	1500	68.5/18.8/4.6/8.1	$Mg_{1.81}Fe_{0.19}SiO_4$	$Fo_{90.3}Fa_{9.7}$	$Mg_{1.75}Fe_{0.12}Ca_{0.08}Na_{0.03}Cr_{0.01}Al_{0.03}Si_2O_6$	$En_{83.1}Fs_{5.8}Di_8Kos_{0.8}Jd_2MgTs_{0.3}CrEn_0$	$Mg_{0.99}Fe_{0.07}Ca_{0.72}Na_{0.11}Cr_{0.03}Al_{0.08}Si_2O_6$	$Di_{65.8}Jd_{8.2}Hd_{6.5}Cen_{16.6}Kos_{2.9}CaTs_0$	$Mg_{2.05}Fe_{0.42}Ca_{0.53}Cr_{0.2}Al_{1.8}Si_3O_{12}$	$Prp_{68.27}Alm_{14.11}Grs_{7.41}Uvr_{10.21}Knr_0$
7	1500	68.5/18.7/4.6/8.2	$Mg_{1.8}Fe_{0.19}SiO_4$	$Fo_{90.29}Fa_{9.71}$	$Mg_{1.75}Fe_{0.11}Ca_{0.08}Na_{0.03}Cr_{0.01}Al_{0.03}Si_2O_6$	$En_{83.5}Fs_{5.5}Di_{7.9}Kos_{0.7}Jd_{2.1}MgTs_{0.3}CrEn_0$	$Mg_{0.98}Fe_{0.06}Ca_{0.73}Na_{0.11}Cr_{0.03}Al_{0.09}Si_2O_6$	$Di_{67.2}Jd_{8.5}Hd_{6.1}Cen_{15.6}Kos_{2.6}CaTs_0$	$Mg_{2.03}Fe_{0.44}Ca_{0.53}Cr_{0.21}Al_{1.79}Si_3O_{12}$	$Prp_{67.73}Alm_{14.69}Grs_{7.09}Uvr_{10.49}Knr_0$
8	1500	68.5/18.3/4.9/8.3	$Mg_{1.81}Fe_{0.2}SiO_4$	$Fo_{90.25}Fa_{9.75}$	$Mg_{1.76}Fe_{0.11}Ca_{0.08}Na_{0.03}Cr_{0.01}Al_{0.02}Si_2O_6$	$En_{83.92}Fs_{5.39}Di_{7.89}Kos_{0.6}Jd_{2.2}MgTs_0CrEn_0$	$Mg_{0.98}Fe_{0.06}Ca_{0.75}Na_{0.11}Cr_{0.02}Al_{0.08}Si_2O_6$	$Di_{69.1}Jd_{8.1}Hd_{5.9}Cen_{14.5}Kos_{2.4}CaTs_0$	$Mg_{2.08}Fe_{0.46}Ca_{0.47}Cr_{0.21}Al_{1.79}Si_3O_{12}$	$Prp_{69.2}Alm_{15.2}Grs_{4.9}Uvr_{10.7}Knr_0$
(c) Tecton										
3	1300	64/11.9/12.1/12	$Mg_{1.8}Fe_{0.2}SiO_4$	$Fo_{89.99}Fa_{10.01}$	$Mg_{1.73}Fe_{0.15}Ca_{0.05}Na_{0.02}Cr_{0.02}Al_{0.08}Si_{1.96}O_6$	$En_{81.82}Fs_{7.29}Di_{5.09}Kos_{1.7}Jd_0MgTs_4CrEn_{0.1}$	$Mg_{0.93}Fe_{0.07}Ca_{0.75}Na_{0.12}Cr_{0.03}Al_{0.1}Si_2O_6$	$Di_{67.8}Jd_{9.5}Hd_{6.9}Cen_{12.8}Kos_{2.9}CaTs_{0.1}$	$Mg_{2.2}Fe_{0.45}Ca_{0.36}Cr_{0.09}Al_{1.91}Si_3O_{12}$	$Prp_{73.2}Alm_{14.9}Grs_{7.5}Uvr_{4.4}Knr_0$
4	1300	64/11.6/11.8/12.5	$Mg_{1.8}Fe_{0.2}SiO_4$	$Fo_{90.05}Fa_{9.95}$	$Mg_{1.75}Fe_{0.14}Ca_{0.05}Na_{0.02}Cr_{0.01}Al_{0.05}Si_{1.98}O_6$	$En_{83.82}Fs_{6.79}Di_{5.09}Kos_{1.2}Jd_{0.9}MgTs_{2.2}CrEn_0$	$Mg_{0.93}Fe_{0.07}Ca_{0.76}Na_{0.12}Cr_{0.03}Al_{0.1}Si_2O_6$	$Di_{69}Jd_{9.7}Hd_{6.5}Cen_{12.2}Kos_{2.6}CaTs_0$	$Mg_{2.17}Fe_{0.47}Ca_{0.37}Cr_{0.1}Al_{1.9}Si_3O_{12}$	$Prp_{72.2}Alm_{15.6}Grs_{7.2}Uvr_5Knr_0$
5	1300	64/11.4/11.7/12.8	$Mg_{1.8}Fe_{0.2}SiO_4$	$Fo_{90.1}Fa_{9.9}$	$Mg_{1.77}Fe_{0.13}Ca_{0.05}Na_{0.02}Cr_{0.01}Al_{0.03}Si_{1.99}O_6$	$En_{85.6}Fs_{6.5}Di_{4.8}Kos_{0.8}Jd_{1.4}MgTs_{0.9}CrEn_0$	$Mg_{0.93}Fe_{0.07}Ca_{0.76}Na_{0.12}Cr_{0.03}Al_{0.1}Si_2O_6$	$Di_{69.13}Jd_{9.59}Hd_{6.49}Cen_{12.09}Kos_{2.7}CaTs_0$	$Mg_{2.13}Fe_{0.49}Ca_{0.38}Cr_{0.1}Al_{1.9}Si_3O_{12}$	$Prp_{71.1}Alm_{16.4}Grs_{7.3}Uvr_{5.2}Knr_0$
6	1300	64/12/10.9/13.1	$Mg_{1.8}Fe_{0.2}SiO_4$	$Fo_{90.15}Fa_{9.85}$	$Mg_{1.78}Fe_{0.12}Ca_{0.05}Na_{0.03}Cr_{0.01}Al_{0.02}Si_2O_6$	$En_{86.5}Fs_6Di_{4.6}Kos_{0.6}Jd_{2.3}MgTs_0CrEn_0$	$Mg_{0.92}Fe_{0.06}Ca_{0.78}Na_{0.12}Cr_{0.03}Al_{0.09}Si_2O_6$	$Di_{71.73}Jd_{9.39}Hd_{5.69}Cen_{10.19}Kos_3CaTs_0$	$Mg_{2.05}Fe_{0.52}Ca_{0.43}Cr_{0.1}Al_{1.9}Si_3O_{12}$	$Prp_{68.37}Alm_{17.22}Grs_{9.21}Uvr_{5.21}Knr_0$
7	1300	64/11.6/11.4/13.1	$Mg_{1.8}Fe_{0.2}SiO_4$	$Fo_{90.15}Fa_{9.85}$	$Mg_{1.78}Fe_{0.12}Ca_{0.05}Na_{0.03}Cr_{0.01}Al_{0.02}Si_2O_6$	$En_{86.81}Fs_{5.89}Di_{4.7}Kos_{0.6}Jd_2MgTs_0CrEn_0$	$Mg_{0.92}Fe_{0.06}Ca_{0.78}Na_{0.12}Cr_{0.02}Al_{0.1}Si_2O_6$	$Di_{72.1}Jd_{10}Hd_{5.6}Cen_{10}Kos_{2.3}CaTs_0$	$Mg_{2.09}Fe_{0.53}Ca_{0.38}Cr_{0.11}Al_{1.89}Si_3O_{12}$	$Prp_{69.6}Alm_{17.7}Grs_7Uvr_{5.7}Knr_0$
8	1300	64/11.6/11.3/13.1	$Mg_{1.8}Fe_{0.2}SiO_4$	$Fo_{90.1}Fa_{9.9}$	$Mg_{1.79}Fe_{0.11}Ca_{0.05}Na_{0.03}Cr_0Al_{0.02}Si_2O_6$	$En_{87.3}Fs_{5.6}Di_{4.6}Kos_{0.4}Jd_{2.1}MgTs_0CrEn_0$	$Mg_{0.92}Fe_{0.05}Ca_{0.78}Na_{0.12}Cr_{0.02}Al_{0.1}Si_2O_6$	$Di_{73.1}Jd_{10.2}Hd_{5.2}Cen_{9.3}Kos_{2.2}CaTs_0$	$Mg_{2.08}Fe_{0.54}Ca_{0.38}Cr_{0.12}Al_{1.88}Si_3O_{12}$	$Prp_{69.33}Alm_{17.98}Grs_{6.79}Uvr_{5.89}Knr_0$
3	1300	64/11.8/12.9/11.3	$Mg_{1.8}Fe_{0.2}SiO_4$	$Fo_{89.93}Fa_{10.07}$	$Mg_{1.68}Fe_{0.15}Ca_{0.08}Na_{0.02}Cr_{0.02}Al_{0.13}Si_{1.94}O_6$	$En_{77.02}Fs_{7.29}Di_{7.79}Kos_{1.6}Jd_0MgTs_{6.19}CrEn_{0.1}$	$Mg_{1.02}Fe_{0.09}Ca_{0.65}Na_{0.12}Cr_{0.02}Al_{0.12}Si_{1.99}O_6$	$Di_{54.2}Jd_{9.4}Hd_{9.2}Cen_{23.8}Kos_{2.3}CaTs_{1.1}$	$Mg_{2.19}Fe_{0.4}Ca_{0.41}Cr_{0.1}Al_{1.9}Si_3O_{12}$	$Prp_{73.07}Alm_{13.31}Grs_{8.41}Uvr_{5.21}Knr_0$
4	1300	64/11.5/12.4/12	$Mg_{1.8}Fe_{0.2}SiO_4$	$Fo_{89.94}Fa_{10.06}$	$Mg_{1.7}Fe_{0.14}Ca_{0.08}Na_{0.02}Cr_{0.01}Al_{0.09}Si_{1.96}O_6$	$En_{79.4}Fs_{6.9}Di_{7.8}Kos_{1.2}Jd_{0.9}MgTs_{3.8}CrEn_0$	$Mg_{1.01}Fe_{0.09}Ca_{0.66}Na_{0.12}Cr_{0.02}Al_{0.11}Si_{1.99}O_6$	$Di_{57}Jd_{9.5}Hd_{8.6}Cen_{22.2}Kos_{2.1}CaTs_{0.6}$	$Mg_{2.18}Fe_{0.41}Ca_{0.41}Cr_{0.11}Al_{1.89}Si_3O_{12}$	$Prp_{72.5}Alm_{13.8}Grs_{8.2}Uvr_{5.5}Knr_0$
5	1300	64.1/10.9/12.7/12.4	$Mg_{1.8}Fe_{0.2}SiO_4$	$Fo_{89.94}Fa_{10.06}$	$Mg_{1.72}Fe_{0.13}Ca_{0.08}Na_{0.03}Cr_{0.01}Al_{0.06}Si_{1.98}O_6$	$En_{81.2}Fs_{6.4}Di_{7.7}Kos_{0.9}Jd_{1.7}MgTs_{2.1}CrEn_0$	$Mg_{1.04}Fe_{0.08}Ca_{0.65}Na_{0.11}Cr_{0.02}Al_{0.11}Si_{1.99}O_6$	$Di_{55.9}Jd_{9.2}Hd_{8.4}Cen_{23.8}Kos_{1.9}CaTs_{0.8}$	$Mg_{2.16}Fe_{0.43}Ca_{0.41}Cr_{0.12}Al_{1.88}Si_3O_{12}$	$Prp_{72.03}Alm_{14.39}Grs_{7.69}Uvr_{5.89}Knr_0$
6	1300	64.1/11.3/11.6/13	$Mg_{1.8}Fe_{0.2}SiO_4$	$Fo_{89.94}Fa_{10.06}$	$Mg_{1.74}Fe_{0.12}Ca_{0.08}Na_{0.03}Cr_{0.01}Al_{0.03}Si_2O_6$	$En_{83}Fs_{6.1}Di_{7.7}Kos_{0.5}Jd_{2.5}MgTs_{0.2}CrEn_0$	$Mg_1Fe_{0.07}Ca_{0.7}Na_{0.12}Cr_{0.02}Al_{0.1}Si_2O_6$	$Di_{62.6}Jd_{9.8}Hd_{7.3}Cen_{18.5}Kos_{1.8}CaTs_0$	$Mg_{2.14}Fe_{0.44}Ca_{0.42}Cr_{0.12}Al_{1.88}Si_3O_{12}$	$Prp_{71.37}Alm_{14.71}Grs_{7.81}Uvr_{6.11}Knr_0$
7	1300	64.1/11.4/11.5/13.1	$Mg_{1.8}Fe_{0.2}SiO_4$	$Fo_{89.94}Fa_{10.06}$	$Mg_{1.75}Fe_{0.12}Ca_{0.08}Na_{0.03}Cr_{0.01}Al_{0.03}Si_2O_6$	$En_{83.4}Fs_{5.8}Di_{7.7}Kos_{0.5}Jd_{2.5}MgTs_{0.1}CrEn_0$	$Mg_1Fe_{0.07}Ca_{0.7}Na_{0.12}Cr_{0.02}Al_{0.1}Si_2O_6$	$Di_{63.34}Jd_{9.89}Hd_{6.79}Cen_{18.18}Kos_{1.8}CaTs_0$	$Mg_{2.12}Fe_{0.46}Ca_{0.42}Cr_{0.12}Al_{1.88}Si_3O_{12}$	$Prp_{70.6}Alm_{15.3}Grs_{7.9}Uvr_{6.2}Knr_0$
8	1300	64/11.8/11/13.1	$Mg_{1.8}Fe_{0.2}SiO_4$	$Fo_{89.89}Fa_{10.11}$	$Mg_{1.75}Fe_{0.11}Ca_{0.08}Na_{0.03}Cr_0Al_{0.03}Si_2O_6$	$En_{83.72}Fs_{5.59}Di_{7.49}Kos_{0.4}Jd_{2.8}MgTs_0CrEn_0$	$Mg_{0.98}Fe_{0.06}Ca_{0.73}Na_{0.12}Cr_{0.02}Al_{0.1}Si_2O_6$	$Di_{66.13}Jd_{10.29}Hd_{6.29}Cen_{15.68}Kos_{1.6}CaTs_0$	$Mg_{2.1}Fe_{0.47}Ca_{0.43}Cr_{0.13}Al_{1.87}Si_3O_{12}$	$Prp_{70}Alm_{15.5}Grs_{8.1}Uvr_{6.4}Knr_0$

Notes: Ol-olivine; Opx-orthopyroxene; Cpx-clinopyroxene; Gt-garnet; Fo-Forsterite (Mg_2SiO_4); Fa-fayalite (Fe_2SiO_4); En-enstatite ($Mg_2Si_2O_6$); Fs-Ferrosilite ($Fe_2Si_2O_6$); MgTs-Mg-tschermakite ($MgAlSiAlO_6$); Di-diopside ($CaMgSi_2O_6$); Jd-jadeite ($NaAlSi_2O_6$); Kos-kosmochlor ($NaCrSi_2O_6$); CrEn-Cr-enstatite ($MgCrSiAlO_6$); Hd-hedenbergite ($CaFeSi_2O_6$); Cen-clinoenstatite ($Mg_2Si_2O_6$); CaTs-Ca-tschermakite ($CaAlSiAlO_6$); Prp-pyrope ($Mg_3Al_2Si_3O_{12}$); Alm-Almandine ($Fe_3Al_2Si_3O_{12}$); Grs-grossular ($Ca_3Al_2Si_3O_{12}$); Uvr-uvarovite ($Ca_3Cr_2Si_3O_{12}$); Knr-knorringite ($Mg_3Cr_2Si_3O_{12}$). - means unavailable.

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