Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SCG58-P01 Room:Convention Hall Time:May 25 18:15-19:30

Re-examination of phase diagram in Enstatite-Ferrosilite system at 1 atm

OHI, Shugo[1*]

[1]Kyoto University, Science

Pyroxene is one of the most important rock-forming minerals not only for its abundant occurrence but also for various paragenesis which provide information on the thermal history of pyroxene-bearing rocks. In the system Mg2Si2O6-CaMgSi2O6, there had been the controversy about the appearance and stability of the orthopyroxene (Opx) phase near 1400 C other than protopyroxene (Ppx) since the discovery by Foster and Lin (1975). In recent years, Ohi et al. (2008) observed the isosymmetric phase transition between low-temperature Opx (LT-Opx) and high-temoperature Opx (HT-Opx) at 1170 C by high-temperature X-ray powder diffraction (HT-XRD) experiments. They concluded that Opx the phase near 1400 C was HT-Opx. In Mg2Si2O6-Fe2Si2O6 system, there was no report about the stability field of HT-Opx. The purpose in present study is to clear the stability field of HT-Opx.

In present study (i) synthetic experiments with gels in Mg2Si2O6- Fe2Si2O6 system and (ii) those with Opx crystals were carryed out. (i) 28 samples were synthesized from gels with 10 kinds of compositions in Mg2Si2O6- Fe2Si2O6 system at temperatures between 1210-1450 C. (ii) Natural Opx (En86Fs14; Bamble, Norway), natural Opx (En83Fs17; Morogoro, Tanzania), natural Opx (En63Fs37; Tamagawa, Ibaragi) and synthetic Opx (En80Fs20 and En70Fs30) was kept at temperatures between 1210-1230 C to observe the transition from Opx to Cpx. Samples of experiments (i) and (ii) were synthesized in one-atmosphere gas mixing (H2-CO2) furnace. The furnace oxygen fugacity maintained near iron-wustite buffer. Recovered samples were analyzed with X-ray powder diffractometer (XRD; Rigaku Smart Lab), a scanning electron microscope (SEM; HITACHI S-3000) and energy dispersive X-ray spectrometer (EDX; HORIBA EMAX7000).

In synthetic experiments of (i), Ppx crystals were observed when En95-85Fs5-15 starting materials were kept at the temperatures 1375-1445 C. Opx phase appeared near 1400 C and En75Fs25 chemical compositions. Cpx phase appeared at temperature between 1200-1300 C. The appearances of Ppx and Opx were coincident with the phase diagram of Mg2Si2O6- Fe2Si2O6 system indicated by Huebner (1980), whereas those of Cpx were not. In synthetic experiments of (ii), the phase transition from Opx to Ppx was observed in the run with Natural Opx (En86Fs14) and those from Opx to Cpx were with natural Opx (En63Fs37) and synthetic Opx (En80Fs20 and En70Fs30) at about 1200 C. The transitions showed the stability field of Opx indicated by Huebner (1980) at about 1200 C was incorrect.

The stnthetic experiments showed Ppx or Cpx were stable at about 1200 C. Huebner (1980) indicated that there was series of Opx stabirity field at 900-1400 C because Opx was known as stable phase below 1000 C and Huebner and Turnock (1980) showed Opx was stable around 1400 C. However, Opx below 1000 C was LT-Opx and that around 1400 C was HT-Opx. Therefore, there was no reason to consider the series of Opx stabirity field at 900-1400 C.

In present study, new phasse diagram of Mg2Si2O6- Fe2Si2O6 system was proposed in consideration of stability field of below 1000 C and around 1400 C and those of Ppx and Cpx at about 1200 C.

Keywords: orthopyroxene, phase diagram, Mg2Si2O6-Fe2Si2O6 system, phase relationship