Phase relationships in the system of pyroxene quadrilateral at high temperature and atmospheric pressure

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In recent year, we observed isosymmetric phase transitions of orthopyroxene in the $Mg_2Si_2O_6$-$Fe_2Si_2O_6$ system and developed the hypothetical phase diagram [1]. The purpose of present study is to research phase relationships in pyroxene quadrilateral system by synthetic experiments and X-ray diffractometry (XRD).

The starting materials for synthetic experiments were gels with $Ca_{0.05}(Mg_xFe_{1-x})_{1.95}Si_2O_6$ (x = 0.05, 0.10, 0.15, 0.20, 0.30 0.40). They were placed in one-atmosphere gas mixing (H_2-CO_2) furnace to maintain the furnace oxygen fugacity near iron-wüstite buffer and heated at 1200-1400 °C for 3-14 days. XRD were performed by using RIGAKU SmartLab (Kyoto University) to phase relationships among protopyroxene (Ppx), high-temperature orthopyroxene (HT-Opx), and pigeonite (Pig).

Experimental results of x = 0.05, 0.10, 0.15, 0.20 chemical compositions showed that the reaction of HT-Opx = Ppx + Pig occurred at 1345-1360, 1280-1310, 1260-1300 and 1370-1390 °C, respectively. We rebuilt phase diagrams in the system of pyroxene quadrilateral based on these result (e.g., Figure 1).

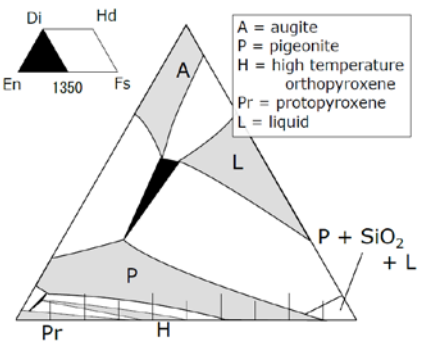

Figure 1. An isothermal section of pyroxene quadrilateral at 1350 °C and 1 bar

[1] Ohi and Miyake (in press) Am. Min.