

Phase transitions between high- and low-temperature orthopyroxene in the $\text{Mg}_2\text{Si}_2\text{O}_6\text{-Fe}_2\text{Si}_2\text{O}_6$ system

SHUGO OHI^{1,2,*} AND AKIRA MIYAKE²

¹Faculty of Education, Shiga University, Otsu 520-0862, Japan

²Graduate School of Science, Kyoto University, Kyoto 606-8502, Japan

ABSTRACT

We observed isosymmetric phase transitions of orthopyroxene in the $\text{Mg}_2\text{Si}_2\text{O}_6\text{-Fe}_2\text{Si}_2\text{O}_6$ system during high-temperature in situ X-ray powder diffraction experiments with a multiple-detector system and a high-temperature strip heater chamber in an atmosphere of Ar plus 1% H_2 . The transition temperatures we determined for natural orthopyroxenes were 1113–1147, 1120–1139, and around 1200 °C for Fs_{10} , Fs_{14} , and Fs_{37} , respectively, and those for synthetic orthopyroxenes were 1048–1075, 961–1048, and 1037–1148 °C for Fs_{20} , Fs_{30} , and Fs_{46} , respectively. Our experiments showed that the transition from low- to high-temperature orthopyroxene in the $\text{Mg}_2\text{Si}_2\text{O}_6\text{-Fe}_2\text{Si}_2\text{O}_6$ system occurred at about 1000–1200 °C. We concluded that the stability field of low-temperature orthopyroxene was below 1000 °C and that of high-temperature orthopyroxene was above 1200 °C.

Keywords: Orthopyroxene, X-ray powder diffraction, isosymmetric phase transition, enstatite-ferrosilite system