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LETTER

An isosymmetric phase transition of orthopyroxene found by high-temperature X-ray diffraction

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ABSTRACT

High-temperature synchrotron X-ray powder diffraction experiments for the composition of $(Ca_{0.06}Mg_{1.94})Si_2O_6$ have been carried out in the present study to clarify whether orthopyroxene has a transition between low- and high-temperature phases. Our results show that discontinuous changes of unit-cell dimensions and volume occur at 1170 °C during both heating and cooling processes and that the space group of *Pbca* does not change during this reversible phase transition. These facts indicate a first-order and isosymmetric phase transition. This high-temperature phase is thermodynamically distinct from the low-temperature phase, i.e., orthoenstatite in the Mg-rich portion of $Mg_2Si_2O_6$-$CaMgSi_2O_6$ phase diagram, although they have the same space group.

Keywords: Orthopyroxene, isosymmetric phase transition, in-situ X-ray experiments, enstatite-diopside system