

Single-crystal X-ray diffraction study of FeGeO₃ high-*P* clinopyroxene (*C2/c*) up to 8.2 GPa

T. HATTORI,^{1,*} T. NAGAI,¹ T. YAMANAKA,¹ S. WERNER,² AND H. SCHULZ²

¹Department of Earth and Space Science, Graduate School of Science, Osaka University, 1-1 Machikanayama, Toyonaka, Osaka, 560-0043, Japan

²Institut für Kristallographie und Angewandte Mineralogie der Universität München, Theresienstrasse 41, D-80333 München, Germany

ABSTRACT

To elucidate pressure effects on the crystal structure of the high-*P* clinopyroxene (space group *C2/c*), the compression process of FeGeO₃ clinopyroxene (*C2/c*) was investigated up to 8.2 GPa by single-crystal X-ray diffraction. The crystal structure of FeGeO₃ is close to the ideal clinopyroxene in terms of the O atom arrangement and the tetrahedral chain configuration at ambient conditions. With pressure the lattice parameters and oxygen positions move closer to the ideal cubic closest packing (CCP) and the tetrahedral chain became more kinked with increasing pressure. However, a change in compression mechanism may occur around 4.5 GPa. All the polyhedra were homogeneously compressed above 4.5 GPa, whereas the MO₆ exhibited compressibilities 3–4 times greater than that of the TO₄ tetrahedra below 4.5 GPa. The Ge-O-Ge angle decreased with increasing pressure to 4.5 GPa and then remained constant. The close relationship between the kink angle and the relative polyhedral size suggests that this unusual compression behavior above 4.5 GPa may be caused by suppression of the extensive decrease of the Ge-O-Ge angle. The present results show that compression of pyroxenes with highly kinked tetrahedral chains is strongly effected by the kink angle.