American Mineralogist, Volume 91, pages 475–478, 2006

LETTER

Equation of state of $CaIrO_3$-type $MgSiO_3$ up to 144 GPa

SHIGEAKI ONO,[1,*] TAKUMI KIKEGAWA,[2] AND YASUO OHISHI[3]

[1]Institute for Research on Earth Evolution, Japan Agency for Marine-Earth Science and Technology, 2-15 Natsushima-cho, Yokosuka-shi, Kanagawa 237-0061, Japan
[2]High Energy Acceleration Research Organization, 1-1 Oho, Tsukuba 305-0801, Japan
[3]Japan Synchrotron Radiation Research Institute, Mikazuki-cho, Sayo-gun, Hyogo 679-5198, Japan

ABSTRACT

The structure and equation of state for $CaIrO_3$-type $MgSiO_3$ were determined using high-pressure powder X-ray diffraction from 116 to 144 GPa. The $CaIrO_3$-type phase remained stable over this entire pressure range. At each pressure increment, the sample was heated with a laser to relax the deviatoric stress in the sample. Pressure-volume data could be fitted to the Birch-Murnaghan equation of state with K_0 = 237(1) GPa using Anderson's gold pressure standard, when K_0' and V_0 were set to 4 and 162.86 Å^3, respectively. This indicates that the bulk modulus of $MgSiO_3$ decreases when the phase transition occurs, because the bulk modulus of perovskite-type $MgSiO_3$ is 250–260 GPa. The *b* axis of the unit-cell parameter was more compressive than the *a* and *c* axes. The unit-cell volumes at high pressures, observed in high-pressure experiments, were slightly smaller than those predicted by theoretical studies.

Keywords: Post-perovskite, crystal structure, $CaIrO_3$-type structure, diamond anvil cell, $MgSiO_3$