Compression of Oxygen Vacancy Type Al-bearing $MgSiO_3$ Perovskite

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$MgSiO_3$ perovskite is believed to be a dominant constituent of the Earth's lower mantle. Experimental results on the effect of Al on the compressibility of $MgSiO_3$ perovskite have been pretty controversial. Two kinds of the Al substitution mechanisms are expected: $2Al^{3+} = Mg^{2+} + S^{i4+}$ and $2Al^{3+} = 2Si^{4+}$ + (as a vacancy site) O^{2-} [1]. Theory predicts that the latter mechanism significantly increases the compressibility [2].

Recently, Kojitani et al (2005) demonstrated the structural differences between these two types of Al-bearing $MgSiO_3$ perovskite on the basis of Rietveld analyses. In this work, the volume compression measurements were performed on the oxygen vacancy type Al-MgSiO3 perovskite by using synchrotron radiation x-rays. Data were collected under hydrostatic conditions using helium pressure transmitting medium. Preliminary results show that the isothermal bulk modulus is reduced due to the incorporation of Al_2O_3 in perovskite with oxygen vacancy.

[1] Navrotsky A., Shoenitz M., Kojitani H., Xu H., Zhang J., Weidner D. J., Jeanloz R., *J. Geophys. Res.*, 2003, **108-B7**, ECV2-1. [2] Yamamoto T., Yuen D.A., Ebisuzaki T., *Earth Planet. Sci. Lett.,* 2003, **206**, 617.

Keywords: perovskite, high pressure mineralogy, synchrotron x-ray diffraction