Elastic wave velocity of antigorite up to 5 GPa and 500ºC

K. MIBE[1]* AND Y. KONO[2]

[1]Earthquake Research Institute, University of Tokyo, Tokyo 113-0032, Japan (*correspondence: mibe@eri.u-tokyo.ac.jp)

[2]HPCAT, Geophysical Laboratory, Carnegie Institution of Washington, Argonne, IL 60439, USA (ykono@ciw.edu)

Introduction

In some previous studies on the elastic wave velocities of serpentine (e.g., [1]), it has been reported that the ratio of compressional wave velocity to shear wave velocity (Vp/Vs) for serpentine is anomalously high compared to other major minerals in the Earth's upper mantle. As the results, seismological studies often discuss that the anomalous Vp/Vs near the plate boundary would be the evidence for the presence of serpentine around subduction zones (e.g., [2]). However, the elastic properties of serpentine have not been fully understood yet because P-T conditions in the previous experimental studies were limited to relatively low P-T (e.g., [3]) or high-P but room T [4]. It is, therefore, important to determine the elastic wave velocities of serpentine in wide range of P-T conditions for better understanding of H_2O transportation to the Earth's interior around subduction zones.

Experimental method

High P-T experiments were conducted using a Paris-Edinburgh cell at Beamline 16 BM-B, HPCAT of the Advanced Photon Source. An Al_2O_3 buffer rod was used for transmitting elastic waves between WC anvil and sample. A $LiNbO_3$ transducer, which generates and receives both Vp and Vs, was attached to the top WC anvil. 30 MHz and 20 MHz electrical sine waves were used to determine Vp and Vs, respectively. The details on ultrasonic measurement setup are described in Kono *et al*. [5]. Powdered gem-quality antigorite was used as a starting material in order to obtain isotropic elastic data. The measurements were done up to about 5 GPa and 500°C.

Results and discussion

The obtained Vp for antigorite increases monotonically with increasing P, whereas Vs is almost constant with P. Both Vp and Vs decrease slightly with increasing T. The detailed data and geophysical implication will be presented.

[1] Christensen (1996) *JGR* **101**, 3139-3156. [2] Kamiya & Kobayashi (2000) *GRL* **27**, 819– 822. [3] Watanabe *et al.* (2007) *Earth Planets Space* **59**, 233-244. [4] Bezacier *et al.* (2013) *JGR* **118**, 527–535. [5] Kono *et al.* (2012) *Rev. Sci. Instrum.* **83**, 033905–033908.