SCG62-P01 会場:3 階ポスター会場 時間:5 月 2 日 16:15-17:30

圧力 1GPa におけるアンチゴライト蛇紋岩弾性波速度の温度依存性
Temperature dependence of seismic velocities in a antigorite serpentinite at 1 GPa

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Serpentines play key roles in subduction zone processes including water transport, seismogenesis, exhumation of high-pressure rocks, etc. Geophysical mapping of serpentinized regions in the mantle wedge leads to further understanding of these processes. Seismic properties of serpentinized peridotites are critical to interpretation of seismological observations. Antigorite is a major form of serpentine, which is stable to higher temperatures. The single-crystal elastic properties were recently revealed via Brillouin scattering technique (Bezacier et al., 2010; 2013). However, the temperature dependence of elastic properties is still poorly understood. We have measured elastic wave velocities in a antigorite serpentinite at high temperature and pressure conditions.

A black massive antigorite serpentinite was collected from the Nagasaki metamorphic rocks, western Japan. It is composed of antigorite (98.0 vol.%), diopside (1.5 vol.%) and magnetite (0.5 vol.%). Microstructural observation reveals an interpenetrating texture characterized by randomly oriented antigorite blades. Antigorite CPO data shows weak concentration of antigorite axes. Elastic wave velocities measured at 180 MPa shows very weak anisotropy in elasticity. Cylindrical samples (D=L=6mm) were made with ultrasonic machining.

Measurements were made at the pressure of 1 GPa and the temperature of up to 550 C, by using a piston-cylinder type high pressure apparatus at ISEI, Okayama University. The pulse reflection technique was employed for velocity measurement. One LiNbO3 transducer with the resonant frequency of 5 MHz was used to transmit and receive ultrasonic signals. The length of the sample at high pressure and temperature conditions was estimated from the length of the recovered sample.

Both compressional and shear wave velocities linearly decrease with increasing temperature. The temperature derivatives are -3.6×10^{-4} (km/s/K) and -2.7×10^{-4} (km/s/K) for compressional and shear wave velocities, respectively. The temperature derivative of compressional wave velocity is close to that observed in the direction subparallel to antigorite *c*-axis (Yano et al., in prep.). The temperature dependence of c33 might dominate that of the effective elastic constants of a randomly oriented polycrystalline aggregate. Applications to seismological observations will also be discussed in this presentation.

キーワード: 地震波速度, 蛇紋岩, アンチゴライト, 沈み込み帯, 流体
Keywords: seismic velocity, serpentinites, antigorite, subduction zone, fluid