The 510th Geodynamics Seminar

The effect of water on the elastic properties of ringwoodite at high P and T condition

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Ringwoodite, which is thought to be a main constituent mineral in the lower half of the transition zone, can incorporate large amount of water in its structure (up to a few wt.% H_2O) as well as wadsleyite [e.g., *Kohlstedt et al.*, 1996]. Recently, up to 2.5 wt.% water was discovered by *Pearson et al.* [2014] in natural ringwoodite included in a diamond, and demonstrated that the mantle transition zone could have substantially higher amounts of H_2O in some regions. Since incorporated water could affect elastic properties [*Keppler and Smyth*, 2006], the elastic bulk and shear moduli of hydrous ringwoodite are urgent required to interpret seismic models in terms of mineralogy and chemical composition. However, its derivatives as a function of water content have been poorly constrained, especially at high pressure and temperature condition. In this study, thermal EoS and elastic properties of ringwoodite with various water contents have been investigated up to 22 GPa and 750 K by using ultrasonic interferometry in conjunction with in-situ synchrotron X-ray diffraction in a multi-anvil apparatus. Present elastic bulk and shear moduli of ringwoodite display negative correlations with water content. Hydration-induced reduction on seismic velocities of ringwoodite did not show obvious attenuation from 12 to 22 GPa, at high temperatures, which is contrast with observations by Brillouin spectroscopy at room temperature [*Schulze et al.*, 2018]. Based on our results, injection of 1 wt.% H_2O into ringwoodite crystal structure still has a strong effect on seismic velocity at the condition relevant to the mantle transition zone, which is similar as increasing temperature 400-500 K. We conclude seismically visible on water in the mantle transition zone.

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