Mineralogy of the lower mantle: constraints from elasticity

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Average compositon and structure of the Earth's deep interior can be approached by comparing observed seismic velocities to appropriate laboratory data collected for candidate materials under relevant conditions. Precise knowledge of the elastic properties of the Earth's deep materials under high-pressure condition is crucial for constructing the accurate mineralogical model of the Earth's deep interior. However, only few experimental acoustic measurements exist under relevant high-pressure and high-temparature conditions.

Recent technical advances in high-pressure Brillouin scattering spectroscopic measurements combined with diamond anvil cell apparatus extended significantly the upper pressure limit for acoustic measurements [1-5] and enables us to explore the sound velocities under simultaneously high-pressure and high-temperature conditions using infrared laser heating techniques [6-7]

Here we present recent progress of elastic wave velocity measurements on Earth's lower mantle minerals by Brillouin spectroscopy combined with diamond anvil cell apparatus with a special emphasis on the effect of iron in bridgmanite. Based on the latest results we have so far obtained, the mineralogical model of the lower mantle will be discussed.

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