

Acoustic velocities of MgGeO₃ gel at high pressure by Brillouin scattering

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Properties of silicate melts are essential for understanding evolution and dynamic behavior of the Earth and terrestrial planets. In the shallow mantle melting processes the density contrast between melts and crystals is well studied, but studies on the deep melting near the core-mantle boundary are still limited due to technical difficulties. The studies of amorphous material, analogs of melt, at high pressure can provide valuable insights about melts in the deep mantle. The Brillouin scattering method is suitable for velocity measurements of amorphous materials. It has been suggested that the change in coordination in the melt or glass structure reflects to the change in acoustic velocity. Thus we conducted sound velocity measurement using the Brillouin scattering method in diamond anvil cell at high pressure. We report in situ high-pressure acoustic velocity measurements of MgGeO₃ gel, an analogue of the MgSiO₃ melt, revealing the gradual coordination change of Ge from four- to six at least up to 80 GPa. We will conduct experiments at higher pressure in order to confirm the possible Ge coordination change in the gel expected to exist in the terrestrial and extraterrestrial planets.

Keywords: sound velocity measurement, high-pressure experiment, mantle dynamics, silicate melts, super-Earth