

Sound velocities of CaSiO₃ perovskite and some implications for deep mantle mineralogy

*Tetsuo Irifune¹, Steeve Gréaux¹

1. Geodynamics Research Center, Ehime University

We have measured sound velocities of CaSiO₃ perovskite (CaPv) under the entire pressure and temperature conditions of the mantle transition region by a combination of in situ X-ray observations and ultrasonic measurements in multi-anvil apparatus. Elastic properties of both tetragonal and cubic forms of CaPv have been obtained, yielding the shear modulus of cubic CaPv substantially lower than the theoretically predicted value. The present results, combined with the corresponding elastic properties of other high-pressure forms of major minerals in the mantle and subducting slabs, suggest the existence of a harzburgite-rich region near the bottom of the mantle transition region. In contrast, basaltic compositions should have significantly lower shear velocities relative to the surrounding pyrolitic mantle, and may explain the low velocity region atop of the lower mantle and the seismic scatterers in the uppermost lower mantle.

Keywords: mantle transition region, lower mantle, sound velocity