Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SIT06-16 Room:303 Time:May 24 16:30-16:45

Experimental constraints on the chemical compositions of the mantle transition region and the lower mantle

IRIFUNE, Tetsuo[1*]

[1]Geodynamics Research Center, Ehime University, [2]Earth-Life Science Institute

Technical developments in mineral physics using Kawai-type multianvil have been made for precise determinations of phase transitions and associated density/velocity changes in high-pressure minerals under the pressure and temperature conditions toward the deeper region of the mantle. We have been studying these properties in materials relevant to the mantle and subducted slabs, which provides tight mineral physics constraints on the chemical compositions of the deep mantle. The results indicate that the mantle transition region, as well as the upper manatle, is made of a pyrolitic composition except for its bottom region, where the existence of materials with higher sound velocities is suggested to account for one-dimensional seismological models such as PREM. As for the deeper region of the mantle, our recent sound velocity measurements on bridgmanite (Higo et al., in prep.) shows that the lower mantle should also have a pyrolitic composition, rather than the more silicon-rich composition close to pyroxene stoichiometry as concluded in a recent work based on Brillouin scattering measurements. This result is consistent with a prediction based on ab initio calculations, suggesting that the bulk mantle of the Earth is significantly depleted in Si relative to CI chondrites.

Keywords: high pressure experiment, mantle transition region, lower mantle, mineral physics, elastic velocity, pyrolite