[EE] Evening Poster | S (Solid Earth Sciences) | S-IT Science of the Earth's Interior & Tectonophysics

[S-IT22]Interaction and Coevolution of the Core and Mantle in the Earth and Planets

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Recent observational and experimental investigations have significantly advanced our understanding of the structure and constituent materials of the deep Earth. Yet, even fundamental properties intimately linked with formation and evolution of the planet, such as details of the chemical heterogeneity in the mantle and light elements dissolved in the core, remained unclear. Seismological evidence has suggested a vigorous convection in the lower mantle, whereas geochemistry has suggested the presence of stable regions there that hold ancient chemical signatures. The amounts of radioactive isotopes that act as heat sources and drive dynamic behaviors of the deep Earth are also still largely unknown. We provide an opportunity to exchange the achievements and ideas, and encourage persons who try to elucidate these unsolved issues of the core-mantle evolution using various methods, including high-pressure and high-temperature experiments, high-precision geochemical and paleomagnetic analyses, high-resolution geophysical observations, geo-neutrino observations, and large-scale numerical simulations. Since this session is co-sponsored by geomagnetism, paleomagnetism and rock magnetism division of the SGEPSS, contributions in geomagnetism and geodynamo simulation are also encouraged.

[SIT22-P05]Thermal conductivity and compressibility of iron and aluminum-bearing bridgmanite: implications for spin-crossover of iron

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Bridgmanite (Bdg), iron (Fe)- and aluminum (Al)-bearing magnesium silicate perovskite is the most abundant mineral in the Earth’s lower mantle. Thus, its thermal conductivity governs the lower mantle thermal conductivity that critically controls the thermo-chemical evolution of both the core and the lower mantle. While there is extensive research for the lattice thermal conductivity of $MgSiO_3$ Bdg, the effects of Fe and Al incorporation on its lattice thermal conduction are still controversial.
We measured the lattice thermal conductivity of Bdg with chemical compositions of $Mg_{0.832}Fe_{0.209}Al_{0.060}Si_{0.916}O_3$, $Mg_{0.793}Fe_{0.075}Al_{0.217}Si_{0.914}O_3$ and $Mg_{0.718}Fe_{0.123}Al_{0.281}Si_{0.878}O_3$ up to 142 GPa, 180 GPa and 74 GPa, respectively, at 300 K using the pulsed light heating thermoreflectance technique in a diamond anvil cell. The results show that the lattice thermal conductivity of $Mg_{0.832}Fe_{0.209}Al_{0.060}Si_{0.916}O_3$ Bdg is 25.5 ± 2.2 W/m/K at 135 GPa and 300 K, which is 19% lower than that of Fe and Al-free Bdg at identical conditions. Considering the temperature effect on the lattice thermal conductivity and the contribution of radiative thermal conductivity, the total thermal conductivity of Fe and Al-bearing Bdg does not change very much with temperature at 135 GPa, and could be higher than that of post-perovskite with identical chemical composition. Our results imply that the compositional variation of bridgmanite do not induce heterogeneity of thermal conductivity in the lateral direction at the core-

mantle boundary. The present results also revealed that the lattice thermal conductivities of $Mg_{0.793}Fe_{0.075}Al_{0.217}Si_{0.914}O_3$ Bdg and $Mg_{0.718}Fe_{0.123}Al_{0.281}Si_{0.878}O_3$ Bdg showed abnormal reduction in the pressure range of 20-40 GPa at 300 K, which may be due to the spin crossover of octahedral Fe^{3+}. This indicates that temperature in the subducted slab could be significantly lower than previously thought, which have a great potential to the lower mantle dynamics, and water transportation to the deeper part of the Earth’s lower mantle.