Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

SIT04-01 Room:201B Time:May 19 14:15-14:30

Lattice thermal conductivity of MgO periclase at high pressure

Saori Imada[1*], Takashi Yagi[2], Kenji Ohta[3], Kei Hirose[1]

[1]Tokyo Institution of Technology, [2]National Institute of Advanced Industrial Science and Technology, [3]Osaka University

The heat flow at the core-mantle boundary affects the core evolution, the thermal convection of the mantle and core, and geomagnetism from driving the geodynamo. The core-mantle boundary region is thermal boundary layer, therefore heat is transported dominantly by conduction from the core to the mantle. Previous studies have estimated thermal conductivity at the lowermost mantle in a wide range as 5-30 W/m/K (e.g. Lay et al. 2008). However, thermal conductivity of the lower mantle minerals is not well constrained yet due to a difficulty in measurement at high pressure condition. In this study, the lattice thermal conductivity of MgO periclase was obtained up to 100 GPa by measuring thermal diffusivity at room temperature in a diamond-anvil cell. We measured thermal diffusivity with the light pulse thermo-reflectance technique, which was recently developed (Yagi et al. 2011). This is an only method to measure the thermal diffusivity at high-pressure condition corresponding to the core-mantle boundary. Based on the pressure effect revealed in this study and the temperature dependence proposed previously (e.g. Hofmeister 1999), the lattice thermal conductivity of MgO periclase at the core-mantle boundary region was calculated. Combined with the values for MgSiO3 perovskite and post-perovskite recently determined (Ohta et al. 2012), the lattice thermal conductivity at the base of the mantle was estimated. Here we will discuss the core-mantle heat flow.

Keywords: thermal conductivity, periclase, core-mantle boundary heat flow, thermal diffusivity