# Thermal conductivity measurement at high pressure and high temperature similar to Earth's lower mantle conditions

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The thermal transport properties of the Earth's constituents are important information to understand the thermal evolution and the heat budget of the Earth. In particular, the thermal conductivity of the core, the largest heat source of the Earth, and the lower mantle, occupying more than half the volume of the whole Earth, are indispensable to the understanding. In recent years, thermal conductivity measurement on the sample inside the diamond anvil cell (DAC) has been carried out utilizing the thermoreflectance phenomenon; the reflectance of metal changes slightly due to the temperature perturbation of several kelvin (e.g. Hsieh et al., 2009 Phys Rev B; Yagi et al., 2011 Meas Sci Technol). However, the reported temperature conditions has been far from that in Earth's interior.

In this study, we combined the pulsed light heating thermoreflectance method in a DAC with high power CW laser heating to obtain the thermal conductivity of material *in-situ* at high pressures and temperatures. We measured the thermal conductivities of Pt and Fe up to approximately 60 GPa and 2000 K and obtained values consistent with previous works (Pt: McWilliams et al., 2015 Phys Earth Planet In, Fe: Konôpková et al., 2016 Nature; Ohta et al., 2016 Nature). The newly developed system here would be a powerful tool to examine the thermal conductivity of Earth's deep interior.