Lattice thermal conductivity of $CaSiO_3$ perovskite at high pressures and high temperatures

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Laboratory measurements of thermal conductivity of deep Earth materials provide important information on the dynamics and thermal evolution of the mantle and the core. $CaSiO_3$ perovskite (CaPv) is a constituent of pyrolitic lower mantle and of the subducting oceanic crust at depth greater than 560 km. In recent years, there are many reports of the laboratory-based lower mantle thermal conductivity profiles, but the thermal conductivity of CaPv has never been measured and included in the models [1,2,3,4,5] . CaPv is an unquenchable high-pressure phase at ambient conditions, and temperature-induced structure change from tetragonal to cubic occurs at around 500 K [6]. Therefore, *in-situ* high pressure and temperature X-ray diffraction (XRD) and thermal conductivity measurements are required to determine the thermal conductivity of CaPv in the Earth’ s deep interior.
In this study, we determined the thermal conductivity of CaPv at about 50 GPa and high temperature to 1950 K by a combination of synchrotron XRD measurements and the pulsed light heating thermoreflectance technique. Based on our experimental results, we consider the effect of the presence of CaPv on the thermal conductivity of the pyrolitic lower mantle and the subducting oceanic crust.

Reference: [1] Manthilake, G. et al., *Proc National Acad Sci.* **108,** 17901–17904 (2011). [2] Ohta, K. et al., *Earth Planet Sc. Lett.* **349,**109–115 (2012). [3] Ohta, K. et al., *Earth Planet Sc. Lett.* **465,** 29–37 (2017). [4] Okuda, Y. et al., *Earth Planet Sc. Lett.* **474,** 25–31 (2017). [5] Hsieh, W.-P. et al., J. Geophys. Res. Solid Earth 122, 4900-4917 (2017). [6] Komabayashi, T. et al., *Earth Planet Sc. Lett.* **260,** 564–569 (2007).

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