Lattice thermal conductivity of bridgmanite at the lower mantle pressures

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The amount of heat flow from the Earth's core to mantle critically determines the thermo-chemical evolution both of the core and the mantle. Bridgmanite, iron and aluminum bearing $MgSiO_3$ perovskite, is the most abundant mineral in the Earth's lower mantle, and thus its thermal transport property controls heat transport in the lower mantle. Here we measured lattice thermal diffusivity of bridgmanite with chemical composition of $Mg_{0.832}Fe_{0.209}Al_{0.060}Si_{0.916}O_3$ up to 39 GPa at 300 K using the pulsed light heating thermoreflectance technique in a diamond anvil cell. The results indicate that the lattice thermal conductivity of the bridgmanite sample is slightly lower than that of iron and aluminum free bridgmantie determined by using the same experimental technique (Ohta et al., 2012). Our result exhibit insignificant effect of iron and aluminum incorporation into bridgmanite on its thermal conductivity, which imply temperature variation in the lower mantle is only factor to induce heterogeneity of thermal conductivity and core heat flux there that could drive large scale dynamics both in the core and mantle.
Reference: Ohta, K. et al. Lattice thermal conductivity of $MgSiO_3$ perovskite and post-perovskite at the core–mantle boundary. *Earth Planet Sc Lett* 349-350, 109–115 (2012).

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