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

[S-IT20]Structure and Dynamics of Earth and Planetary Mantles

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Interdisciplinary approach can lead to a better understanding of dynamics and evolution of the deep interiors of the Earth and planets. We welcome any submissions of recent results in observational, theoretical and experimental studies on seismology, geomagnetism, mineral physics, dynamics of deep interiors, and any other relevant fields from researchers in many countries. Integration of such results is also welcome. In particular, we encourage any contributions focusing on "plate and mantle dynamics in Earth and terrestrial planets".

[SIT20-P07]Simultaneous measurement of thermal conductivity and diffusivity for fayalite and its γ- phase

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Knowledge of thermal properties of mantle materials under high pressure and high temperature are essential for a quantitative understanding of the thermal state and dynamics of the Earth’s interior. Thermal conductivity and thermal diffusivity, the most fundamental thermal properties, play a key role in controlling the heat transport in thermal boundary layer which provides the energy for the dynamic earth. Fayalite is the iron end member of olivine, which is the dominating mineral in the Earth’s upper mantle. Under high pressure, fayalite undergoes a phase transition to ahrensite(γ- phase), the iron end member of ringwoodite. Numerous studies on thermal properties of Mg_2SiO_4 polymorphs have been performed, on the contrary, much less knowledge of Fe_2SiO_4 polymorphs has been obtained. Information about heat capacity of Fe_2SiO_4 polymorphs under high pressure and high temperature is also not sufficient. We applied a pulse heating method to simultaneously measure the thermal conductivity and thermal diffusivity for fayalite and its high pressure polymorph. The sample was sintered fayalite synthesized by piston-cylinder apparatus. We measured up to 5 GPa and 1000K for fayalite and 12 GPa and 1000K for γ- phase. The difference between fayalite and ahrensite was readily distinguished. Heat capacities of fayalite and ahrensite were calculated using the thermal conductivity and thermal diffusivity from measurement results. The heat capacity of ahrensite is apparently lower than fayalite which is different from the case of Mg_2SiO_4 forsterite and ringwoodite according to previous study. The heat capacity of fayalite and ahrensite under room pressure is also higher than previous data. Considering the error from the noise of the raw data, we will perform another experiment to obtain data of higher quality. We expect to present some better results.

Osako et al. (2004) Physics of the Earth and Planetary Interiors, 143-144, 311-320

Yong et al. (2007) Phys Chem Minerals, 34, 121-127

R.A. Robie (1982) America Mineralogist, 67, 463-469

Kojitani (2012) America Mineralogist, 97, 1314-1319