Geodynamics Seminar

第362回ジオダイナミクスセミナー

Thermal conductivity of $MgSiO_3$ perovskite and post-perovskite at deep mantle conditions from first principles

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主催：愛媛大学地球深部ダイナミクス研究センター
日時：6/28（金）午後 4時30分～
場所：総合研究棟 4F 会議室

Abstract

Thermal transport property of minerals under pressure (*P*) and temperature (*T*) is of importance for understanding thermal structure and its thermal history of the Earth. Thermal conductivity (κ) is a fundamental physical parameter in controlling heat transfer in the Earth's interior. Despite its importance, the thermal conductivity of mantle minerals has long been unconstrained at deep mantle conditions particularly owing to experimental difficulty. κ of Earth's lower mantle (LM) minerals has therefore often been inferred by extrapolating limited number of data measured at low-*P, T* conditions. Large extrapolations to high-*P, T* conditions, however, cause significant uncertainties at deep mantle conditions. *Ab initio* theory has been extended recently to evaluate the lattice thermal conductivity (κ_{lat}). The intrinsic bulk thermal conduction of insulator is caused by the lattice anharmonicty owing to phonon-phonon interactions. We developed an approach to calculate the anharmonic coupling strength of the three-phonon process based on the density-functional perturbation theory (DFPT).

In this presentation, I will discuss κ_{lat} of both $MgSiO_3$ perovskite (Mg-Pv) and post-perovskite in a wide *P, T* range covering the entire LM conditions using our DFPT-based techniques. At mantle conditions, iron is known to dissolve into both Mg-Pv and MgO to form solid solutions $(Mg,Fe)SiO_3$ and (Mg,Fe)O. Effects of phonon-impurity scatterings on phonon lifetime will also be discussed to evaluate effective κ of $(Mg,Fe)SiO_3$ at deep mantle conditions.

詳細は当センターホームページ: http://www.ehime-u.ac.jp/~grc/をご覧ください
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