The 440th Geodynamics Seminar

Equation of state at multi-megabar pressure II

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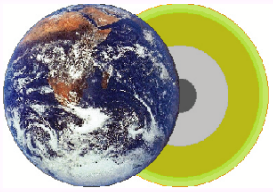
Date: 15 April (Fri.) 2016, 16:30 ~
Venue: Meeting Room #486, Science Research Bldg. 1, Ehime Univ.

日時：2016年4月15日(金)16:30～
場所：愛媛大学 総合研究棟Ⅰ 4階共通会議室



EHIME UNIVERSITY GRC GEODYNAMICS RESEARCH CENTER

Abstract

The $MgSiO_3$ post-perovskite (PPv) phase is the most abundant silicate phase in a super-Earth's mantle, although it only exists within the Earth's lowermost mantle. In *Sakai et al.* (2016), we examined the P-V-T relationship of $MgSiO_3$ PPv at up to 265 GPa by using a Laser heated diamond anvil cell experiment, and up to 1200 GPa and 5000 K by the ab initio calculation within the density-functional theory. The Keane and AP2 EoS models were newly adapted to this phase in order to establish the thermodynamic EoS at multi-megabar conditions, with the parameters set at infinite pressure. The parameters such as V_0, γ_0, γ_∞, and K'_∞ were successfully determined by using data with a wide P-T range. The obtained parameters were found to be very consistent between those obtained in the experiment and those obtained by theoretical calculation. Thus both the experimental and theoretical EoS were also found to be in very good agreement for volumes at pressures and temperatures of up to 300 GPa and 5000 K, respectively. Furthermore, these parameters satisfy the rigorous thermodynamical constraints. The present result is the first report of the fully experimentally based Grüneisen parameter using LHDAC data. Its tendency with respect to the volume was fairly consistent with the theoretical prediction. This reduced the previously reported discrepancy observed between experiment and theory. Our newly developed EoS should be applicable to a super-Earth's mantle, as well as the Earth's core-mantle boundary region.

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