The 422th Geodynamics Seminar

Stability region of the liebermannite-lingunite solid solution

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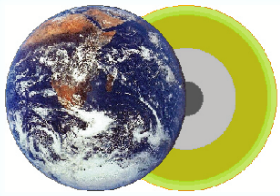
Date: 7.24.2015 (Fri) 16:30 ~
Venu: Meeting Room #486, Science Research Bldg 1, Ehime Univ.

日時：2015年7月24日(金)16:30～
場所：愛媛大学 総合研究棟Ⅰ 4階共通会議室



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Abstract

Aluminosilicate hollandite, with the chemical formula of $(K,Na)AlSi_3O_8$, is a potential host mineral of K and Na in the deep Earth. The Na hollandite end member is called lingunite, and the K hollandite end member was named liebermannite recently. To understand the behavior of the liebermannite-lingunite solid solution, phase relations in the system $KAlSi_3O_8$-$NaAlSi_3O_8$ in the pressure range from 10 to 28 GPa have been made experimentally, however, it is still not clear whether or not the end members can form infinite solid solution with the hollandite structure under some conditions. Previous high pressure experiments obtained K hollandite with the limited Na content up to 50 mol %, on the other hand, Na-rich hollandite with the Na content of about 80 mol % was discovered in some meteorites. In the present study, we investigated the above mentioned phase relations at about 22 GPa, 1873 and 2273 K separately, and successfully synthesized Na-rich hollandite with the Na content of 78 mol % for the first time at 22 GPa and 2273 K, which is compositionally close to the natural Na-rich hollandite. Our data show that the solubility of Na in K hollandite is very sensitive to both pressure and temperature, especially at the pressure corresponding to the dissociation of jadeite into the calcium ferrite type $NaAlSiO_4$ and stishovite, and there may be a stability region for Na hollandite end member at slightly higher temperatures. The effect of Na substitution on the structure of K hollandite will be exhibited via lattice parameters, Raman spectra and the phase transition from the tetragonal hollandite to a monoclinic structure named hollandite II at room temperature.

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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