Crystal chemistry of a hydrous phase [AlOOH-$MgSiO_2(OH)_2$] in the deep lower mantle: a multigrain approach

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Hydrous minerals play a important role in the transprotion and storage of water in Earth's deep mantle. The hydrous phase [AlOOH-$MgSiO_2(OH)_2$] was found stable and coexisting with the dominant lower mantle minerals, bridgmanite or post-perovskite, under equilibrium *P-T* condtions to the deepest lower mantle [1]. In this study, we have synthesized AlOOH-$MgSiO_2(OH)_2$ coexisting with both bridgmanite and post-perovskie at 107 GPa and 2300 K. Individual grains of each phase, AlOOH-$MgSiO_2(OH)_2$, aluminous bridgmanite, and aluminous post-perovkiste, were sorted out using the multigrain approach [2]. Recent deveopment has allowed in situ crystal structure determination of a minor phase in a multiphase assemblage contained in a diamond anvil cell (DAC) [3]. In situ single-crystal structure of AlOOH-$MgSiO_2(OH)_2$ can be obtained by merging several grains having arbitrary orientations for structure determination and refinement. The detailed crystal chemistry of AlOOH-$MgSiO_2(OH)_2$ is essential for understanding the hydration mechanism in the deep mantle. In addition, the phase relations between the hydration phase AlOOH-$MgSiO_2(OH)_2$ and bridgmanite and post-perovskite will be discussed.

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