Minor elements in bridgmanite: review of experimental data

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Bridgmanite is the major phase of the lower mantle ultrabasic association and the most abundant mineral in the Earth [1]. It is observed as inclusions in natural UHP diamonds in association with magnesiowüstite, ringwoodite, $CaSiO_3$-perovskite, tetragonal almandine–pyrope phase (TAPP), high-pressure $(Mg,Fe)(Al,Cr)_2O_4$ polymorphs, native Ni, and sulfides [2].

According to the pyrolite model [3], chromium, titanium, and sodium are characterized by the low bulk concentrations in the Earth's mantle (0.42 wt % Cr_2O_3, 0.2 wt % TiO_2, 0.57 wt % Na_2O). The influence of such elements on structural peculiarities of bridgmanite is poorly investigated [4], although even their small concentrations may influence significantly on the physical properties of bridgmanite. At the same time, the minor-element composition is typomorphic for bridgmanite: incorporation of Cr indicates an ultrabasic mantle lithology, whereas Ti- and Na-rich bridgmanites may occur in the mantle as a result of oceanic crust subduction.

Here we report the new experimental data on the minor-element composition of bridgmanite. It is shown that Cr, Ti, and Na in pridgmanite have significant influence on its cell parameters, P–T conditions of phase transitions, and phase relations in the lower-mantle systems.

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