

Pressure-driven phase transitions in hydrated borates

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Abstract text

Hydrated borates (*e.g.*, colemanite, ulexite, kernite and borax) are the most common ore minerals of boron, an important geochemical marker, in pegmatitic and granitic systems, for petrogenetic processes and a strategic element in a series of technological applications. Hydrated borates, which have been listed as critical raw materials by the EU [1], could be used as aggregate in neutron-shielding Sorel or Portland concretes, enhancing the adsorption towards thermal neutrons. In hydrated borates, the main structural units are $B\phi_x$ units (tetrahedra and planar trigonal group where ϕ is an anion, O^{2-} or OH^-), connected in such a way to form clusters of polyions connected to alkaline/Earth alkaline (mainly Na^+ , K^+ , Ca^{2+} , Mg^{2+}) polyhedra. In these structures, H_2O molecules and OH^- form a complex and pervasive hydrogen-bond network, often enhancing the connection between the polyions clusters and the cations-polyhedrons, therefore playing a paramount role in the stability of the crystalline edifice [2, 3]. The aim of this contribution is to analyze and provide insides on the high-pressure behavior and structure evolution of several hydrate borate minerals, unveiling the phase transition driving deformation mechanisms that lead to the formation of their high-pressure polymorphs. A common pattern, that could be used to predict the high-pressure phase stability of this class of minerals, has been detected.

References

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