Poster

Structural evolution and pressure-driven phase transitions in hydrated borates

D. Comboni[1], G.D. Gatta[1]*, T. Battiston[1], P. Lotti[1], M. Hanfland[2]

[1]Earth Science Department A. Desio, Milan University, Via S. Botticelli 23, MI, Italy, [2]ESRF, European Synchrotron Radiation Facility, 71 Avenue des Martyrs, Grenoble, France

diego.gatta@unimi.it

Hydrated borates (*e.g.*, borax, tincalconite, colemanite, kernite, ulexite) 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 have been listed as critical raw materials by the EU [1], and they could be used as aggregate in neutron-shielding Sorel or Portland concretes, enhancing the adsorption of concrete towards thermal neutrons. The main structural units in hydrated borates are $B\varphi_x$ units (fundamental building blocks, *i.e.*, 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, which reinforce the connection between the polyions clusters and the cations-polyhedrons, playing a paramount role in the stability of the crystalline edifice [2, 3]. In the last 4 years, a number of studies have been performed at high pressure unveiling phase transition driving deformation mechanisms' that lead to the formation of their high-pressure polymorphs (Fig. 1). Critically, the pressure at which hydrated borates undergo a phase transition is related to the water content of the mineral itself. The aim of this contribution is to provide insides on the high-pressure behavior and structure evolution of selected hydrate borate minerals.

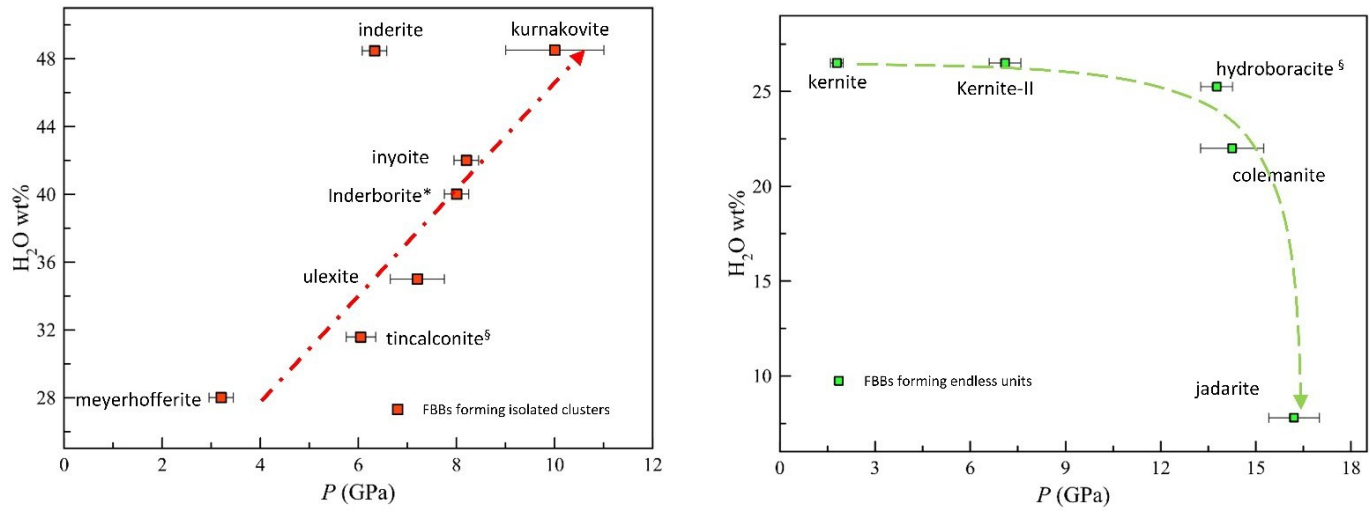

Figure 1. Water content *vs* pressure at which hydrated borates undergo a phase transition (* paper under review, §data collected and still unpublished). FBBs: fundamental building blocks.

[1] EU Commission, Study on the review of the list of critical raw materials, 2017.https://doi.org/10.2873/876644.

[2] Pagliaro, F., Lotti, P., Battiston, T., Comboni, D., Gatta, G.D., Cámara, F., Milani, S., Merlini, M., Glazyrin, K., Liermann, H. (2021) *Constr. Build. Mater.*, 266, 121094.

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