Grenoble, 26-01-2023

Summary

During the beamtime ES-1058, (DOI:10.15151/ESRF-ES-502121336), performed between august 25th 2021 and august 28th 2021 at ID15b, ESRF, single crystals of inyoite and jadarite have been compressed, at ambient temperature, up to ~17 and ~18.5 GPa respectively (Fig.1), using helium as pressure-transmitting medium. In the case of jadarite, 1 additionally powder experiment (up to 20 GPa) was performed.

Results

Results concerning jadarite are currently been analysed, but they clearly show that jadarite undergoes a first order phase transition, at about 16.5 GPa. The crystalline structure of the high-pressure polymorph of jadarite has been successfully resolved (Fig. 2), a paper has been accepted and published in the Journal of the American Ceramic Society (DOI: 10.1111/jace.18659)

Data regarding inyoite also reveal a first order phase transition, occurring at about 8 GPa (Fig.1) but, above the phase transition, the poor-quality of the data (due to the loss of crystalline order) prevented the resolution of the crystal-structure of the inyoite high-pressure polymorph. Nonetheless, data reveal interesting features that have been addressed and published in Physics and Chemistry of Minerals (DOI: 10.1007/s00269-021-01173-3)

Final remarks

Overall, ID15b produced high-quality data and the results are really promising: ideally, 2 papers will be produced. ID15b is the ideal beamline for this kind of experiment due to the small-size of the beam, its Eiger2 9M detector and its user-friendly set-up. We will submit, in the framework of a broader project, that aims to study the high-pressure and temperature stability of hydrated borates, in order to better understand the presence of common features that could be used to forecast their P-T range of stability, further proposals on other hydrated borates.

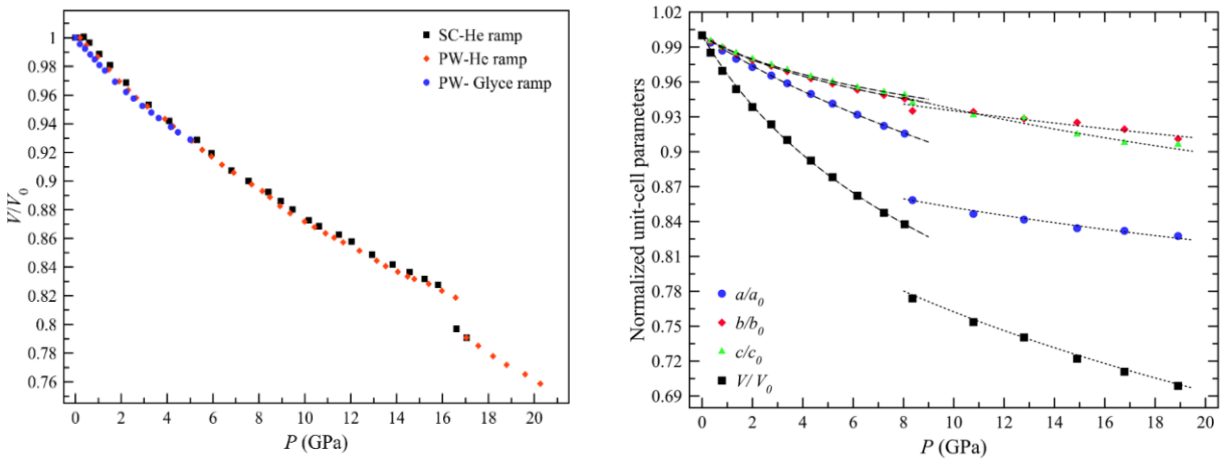

Fig. 1: High- pressure evolution of the unit-cell volume of jadarite (left) and inyoite (right).

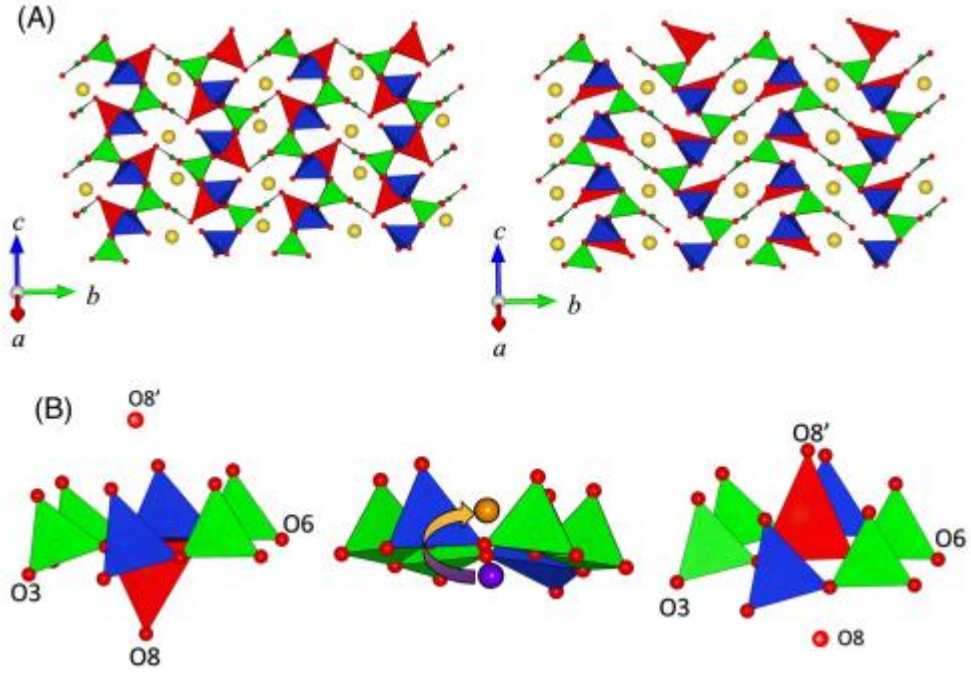

Fig. 2: (left)low- and (right) high-pressure polymorph of jadarite (Li-tetrahedra in red, Bϑ_x units in green, SiO tetrahedra in blue).