Tuesday 25 August 2026

8:30 Registration

Plenary 2 (Chair: Francisco Javier Manjón) (Auditorium)

9:00 **Dominique Laniel**, University of Edinburgh, ***A First Foray into High-Pressure Carbonitride Wonderland***

10:00 **Coffee Break**

T3.1 Electronic, Magnetic, Caloric and Transport properties (Chair: Jiri Prchal) (Nausica 2)

10:30 **Dmitrii SEMENOK**, HPSTAR, Beijing, ***Ultrastable Metal Polyhydrides Below 60 GPa, (invited)***

11:00 **Chunhui YE**, University of Science and Technology of China, China, ***Pressure-Induced Flat Bands and Zero-Field Chern States in Large-Angle Twisted Bilayer Graphene***

11:20 **Yupeng WANG**, University of Science and Technology of China, ***High-Pressure Tuning of Dynamic Magic-Angle Correlated States in Twisted Bilayer Graphene***

11:40 **Matthias LAMP,** Experimentalphysik II, University of Augsburg, ***Charge dynamics in the Weyl semimetals $NbIrTe_4$ and $TaIrTe_4$ under pressure: Signatures of an electronic phase transition***

12:00 **Guy MAKOV**, Ben Gurion University, **Universal origin of anomalies in compressed liquid alkalis**

T6.1 High-Pressure Crystallography: Session in honor of Michael Hanfland (chair: Marco Merlini) (Auditorium)

10:30 **Anna PAKHOMOVA**, ESRF, ***Clathrate hydrates at high pressure: The cases of methanol enclathration, (invited)***

11:00 **Daniel ERRANDONEA,** Universidad de Valencia, ***Theory-guided discovery of pressure-induced transitions in the fast-ion conductor $BaSnF_4$***

11:20 **Benedetta CHRAPPAN SOLDAVINI,** Università degli Studi di Milano, ***High Pressure and High Temperature polymorphism of Na_2CO_3 up to 10 GPa***

TBA 11:40 **Davide COMBONI,** Università di Milano, ***ID15b and Hydrated borates at High-pressure,* TBA**

12:10 **Tomasz POREBA,** EPFL, Lausanne, ***Cryogenic stabilization of molecular hydrogen in dense cubic ice***

12:30 **Lunch**

T3.2 Electronic, Magnetic, Caloric and Transport properties (Chair: Daniel Errandonea) (Auditorium)

23-28 August 2026, Palavas-les-Flots/Montpellier, France: 63rd meeting of the European High Pressure Research Group
T6.1-O4 High-Pressure Crystallography

ID15b and Hydrated borates at High-pressure

Davide Comboni (Milan University, Italy),
Benedetta Chrappan-Soldavini (Milan University, Italy)
Paolo Lotti (Milan University, Italy),
Gatta Giacomo Diego (Milan University, Italy)
Marco Merlini (Milan University, Italy),
Gaston Garbarino (ESRF, France)
Michael Hanfland (ESRF, France)

Abstract

Hydrated borates, such as colemanite, kernite, ulexite, and borax, represent the primary ore minerals of boron—a critical geochemical marker for petrogenetic processes and a strategic resource for advanced technological applications. Classified as critical raw materials by the EU in 2017[1], these minerals are increasingly investigated as aggregates in neutron-shielding concretes due to their high thermal neutron absorption capacity, stemming from their elevated H and ^{10}B content. Structurally, hydrated borates consist of $B\varphi_x$ units (tetrahedra and trigonal planes), where φ represents an oxygen atom or a OH^- group or a H_2O molecule, organized into polyion clusters, which are linked to alkali or alkaline-earth polyhedra (*e.g.*, Na^+, $Ca2^+$, Mg^{2+}). Within these frameworks, H_2O molecules and OH^- groups form an extensive hydrogen-bond network that is fundamental to the stability of the crystalline edifice [2, 3]. This contribution explores the high-pressure deformation mechanisms and structural evolution of various hydrated borates, investigated via synchrotron X-ray diffraction at the ID15b beamline (ESRF). Our results show that these minerals undergo several high-pressure phase transitions. These involve the conversion of trigonal $B\varphi_3$ units into $B\varphi_4$ tetrahedra through the formation of additional B-φ bonds, or the rearrangement of the coordination spheres surrounding the divalent/trivalent cations (*e.g.*, Fig. 1). Interestingly, a recurrent structural pattern appears to emerge, potentially providing a basis for a predictive framework regarding the high-pressure stability of this mineral class (Fig. 2).

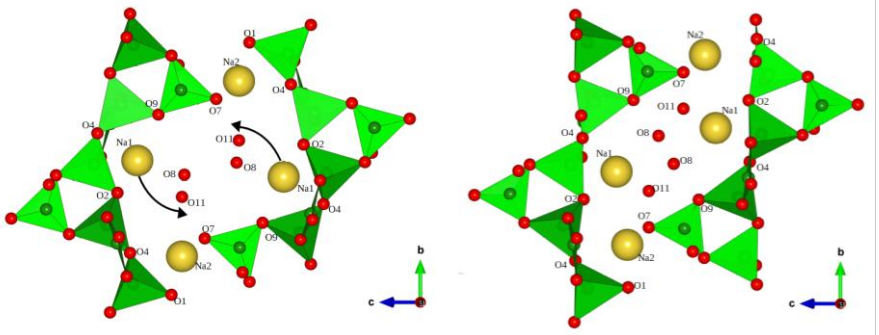

Fig.1: difference between the structures of kernite (left) and kernite-II (right)

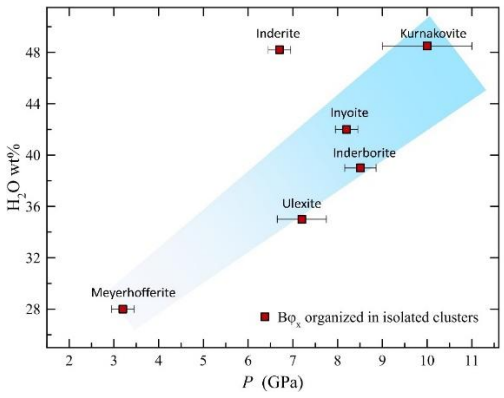

Fig.2: H_2O wt% *vs* $P_{(phase\ transition)}$ in a number of hydrated borate structures

References

[1] EU Commission, Study on the review of the list of critical raw materials, 2017.https://doi.org/10.2873/876644.
[2] Comboni D., Rumsey M. S., Battiston T., Pagliaro F., Lotti P., Hanfland M., Gatta G.D. (2022). High-pressure behavior and phase transition of jadarite, a promising B and Li mineral commodity. Journal of the American Ceramic Society. https://doi.org/10.1111/jace.18659
[3] Comboni D., Battiston T., Lotti P., Hanfland M., Gatta G.D. (2024) Atomic-scale deformation mechanisms at high-pressure in inderborite, $CaMg[B_3O_3(OH)_5]2(H_2O)_4{\cdot}2H_2O$. Mineralogical Magazine, 88, 473–481 https://doi.org/10.1180/mgm.2024.29.