EUROPEAN SYNCHROTRON RADIATION FACILITY

INSTALLATION EUROPEENNE DE RAYONNEMENT SYNCHROTRON

Experiment Report Form

	Experiment title: Compressibility studies of novel metal borides	**Experiment number**: HC 1331
Beamline: ID15B	**Date of experiment**: from: 16 Apr 2014 to: 19 Apr 2014	**Date of report**: 20.09.2022
Shifts: 9	**Local contact(s)**: Michael Hanfland	*Received at ESRF:*

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Report:

The data was published in:

Bykova, E., Gou, H., Bykov, M., Hanfland, M., Dubrovinsky, L., & Dubrovinskaia, N. (2015) Crystal structures and compressibility of novel iron borides Fe_2B_7 and Fe_xB_{50} synthesized at high pressure and high temperature. *J. Solid State Chem.*, 230, 102–109. http://dx.doi.org/10.1016/j.jssc.2015.06.040

Abstract:

We present here a detailed description of the crystal structures of novel iron borides, Fe_2B_7 and Fe_xB_{50} with various iron content (x = 1.01(1), 1.04(1), 1.32(1)), synthesized at high pressures and temperatures. As revealed by high-pressure single-crystal X-ray diffraction, the structure of Fe_2B_7 possesses short incompressible B–B bonds that results in high bulk modulus. Like similarly structured FeB_4 and MnB_4, Fe_2B_7 is as stiff as diamond in one crystallographic direction, while its volume compressibility is even lower than that of FeB_4 and MnB_4. Fe_xB_{50} adopts the structure of the tetragonal δ-B, in which Fe atoms occupy an additional interstitial position. Fe_xB_{50} does not show anisotropy in elastic behavior.

Bykova, E., Tsirlin, A. A., Gou, H., Dubrovinsky, L., & Dubrovinskaia, N. (2014) Novel non-magnetic hard boride Co_5B_{16} synthesized under high pressure. *J. Alloys Compd.*, 608, 69–72.
http://dx.doi.org/10.1016/j.jallcom.2014.04.104

Abstract:
A first cobalt boride with the Co:B ratio below 1:1, Co_5B_{16}, was synthesized under high-pressure high-temperature conditions. It has a unique orthorhombic structure (space group *Pmma*, a = 19.1736(12), b = 2.9329(1), and c = 5.4886(2) Å, R_1 (all data) = 0.037). The material is hard, paramagnetic, with a weak temperature dependence of magnetic susceptibility.