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Novel metal borides: structure, high-pressure behavior and properties. ELENA BYKOVA, Bavarian Research Institute of Experimental Geochemistry and Geophysics, University of Bayreuth, HUIYANG GOU, Material Physics and Technology at Extreme Conditions, University of Bayreuth, MICHAEL HANFLAND, ID09A, ESRF, ARTEM ABAKUMOV, EMAT, University of Antwerp, NATALIA DUBROVINSKAIA, Material Physics and Technology at Extreme Conditions, University of Bayreuth, LEONID DUBROVINSKY, Bavarian Research Institute of Experimental Geochemistry and Geophysics, University of Bayreuth —
Metal borides are an important class of compounds having a number of remarkable properties like superconductivity, low compressibility, and high hardness. Therefore synthesis of novel metal borides and their investigations have a great interest for materials science and technology. Novel metal borides, FeB_4, Fe_2B_7, FeB_{50}, and MnB_4, have been obtained in a series of high pressure and high temperature experiments in multi-anvil apparatus. The current work is focused on their crystal structures determined by single crystal X-ray diffraction and physical properties, such as compressibility and hardness. Rather low compressibility of all studied iron borides has been revealed in X-ray diffraction experiments in diamond anvil cells where single crystals were compressed up to 40-50 GPa. In particular, bulk modulus of FeB_4 was found to be K=252(5) GPa. This value correlates very well with a very high hardness (Hv=65(5) GPa) of this material. Additionally, FeB_4 shows phonon-mediated superconductivity below 2.9 K, thus opening a class of novel materials with a highly desirable combination of physical properties.

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