RIXS Spectroscopy at High Pressure: Mott-Hubbard Gap Collapse in Iron Borate at the Spin Crossover Transition

Viktor V. Struzhkin[1], Jung-Ho Kim[2], Yuri Shvydko[2], Alexander Gavriliuk[3], and Sergey Ovchinnikov[4]

[1]Carnegie Institution of Washington, Washington DC 20015
[2]Argonne National Laboratory,Advanced Photon Source, Argonne, IL 60439
[3]Institute for High Pressure Physics, Troitsk 142190 Russia
[4]L. V. Kirensky Institute of Physics, Krasnoyarsk 660036 Russia

We have collected first high-pressure Fe pre-edge resonant inelastic x-ray scattering (RIXS) spectra under pressure at MERIX beamline (sector 30 at the Advanced Photon Source, Argonne National Laboratory). It has been suggested from the earlier optical absorption measurements that a spin-crossover transition in $FeBO_3$ starting at about 50 GPa is responsible for the dramatic reduction of the Mott-Hubbard energy gap in this material. Our measurements confirm this conclusion and provide further details on the interplay between multiorbital effects and Mott physics in $FeBO_3$. The high pressure RIXS technique will be further discussed, with the emphasis on possible improvements.