Nuclear resonance scattering at high pressure: status and future

Aleksandr Chumakov

European Synchrotron Radiation Facility

For high-pressure studies, nuclear resonance scattering offers hyperfine spectroscopy with high spatial resolution and phonon spectroscopy with high energy resolution. Hyperfine spectroscopy provides data on magnetic state, oxidation degree, and oxygen coordination, whereas phonon spectroscopy allows for accessing dynamic and thermodynamic properties, in particular, elastic moduli and sound velocity at extreme conditions.

At present, Nuclear Resonance beamline ID18 at ESRF serves users with the beam size of about 10 microns, and the energy resolution of about 0.5 meV. In frames of the EBS Upgrade Programme of the ESRF, we expect to improve both parameters by about an order of magnitude, namely, to come to the beam size of about 200 nm and the energy resolution of about 50 – 100 μeV.

The talk provides a short overview of the new instrumentation and corresponding scientific perspectives.