

ESRF high pressure laboratory: present and future

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In the last decades, we have witnessed an unprecedented surge in high-pressure research that has greatly improved our fundamental understanding of materials under high compression. The X-ray investigation of matter under extreme conditions has become one of the major activities at the ESRF and other 3rd generation synchrotron sources. The array of techniques, initially restricted to structural measurements using X-Ray diffraction, is now extended and includes many others such as Inelastic X-ray Scattering, Nuclear Inelastic Scattering, X ray absorption and emission spectroscopy, X ray magnetic circular dichroism, X-ray Compton scattering and X-ray magnetic scattering. As a direct consequence, many scientific breakthroughs have been achieved across fields ranging from Earth and planetary sciences to fundamental physics, chemistry, materials research, and extending into biophysics and biochemistry including questions concerning life and biological function under extreme conditions. The very intense and highly focused X-ray beam available at the new EBS-ESRF will be a unique tool for probing microscopic samples at extreme pressures and temperature. In this context, we will present the on-site capabilities available at the High Pressure Laboratory to prepare the most challenging extreme conditions experiments. We will also discuss recent instrumental developments and new scientific results obtained at ESRF beamlines.