

# **In-situ LVP experiments for investigation of materials deformation under high pressures**

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The early 2000's saw a general development of in-situ measurements using synchrotron x-rays and the large volume presses. These occurred a few years after the first beams at third generation synchrotrons. More than twenty years after, developments of experimental setups (including high pressure cells, apparatuses) have been made, a number of lessons have been learned on data interpretation and significance, some tools have been developed or adapted for data analysis.

This is especially true for deformation of materials under high pressures and high temperatures. Fundamental progresses were made in that area, including (but not limited to) the understanding of deformation of minerals in the earth interior. Even though these studies remain demanding today both from the data analysis and the technical point of view, the basic measurements have been facilitated.

I will give an overview of these experiments, from hardwares, to setups, and x-ray data analysis, and illustrate how they can be used to understand mechanical behavior of materials under high pressures. I will include recent developments on these setups using acoustic emission monitoring, and illustrate how these can be used to monitor brittle-like failure of materials. While some challenges have been overcome, others actually remain at the limit of what the technique can offer. I will outline some directions in which upgrades such as the EBS at ESRF can bring more information in the field of material deformation under high pressures.