

Structure and melting/crystallization dynamics under high pressure and high temperature conditions by x-ray absorption spectroscopy

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We developed a new high-temperature/high-pressure setup for diamond anvil cells allowing for combined x-ray absorption and diffraction measurements in a wide range of temperatures and pressures. The new device is internally heated and can host nanocrystalline diamond anvils, thus is ideally suited for x-ray absorption spectroscopy (XAS) under high pressure using the dispersive setup at the ODE beamline [1-3]. It is conceived to allow measurements up to 1000 K (and more) under controlled heating and cooling rates.

XAS measurements have been carried out on simple polymorphic substances for which the combination of different and complementary techniques is important to get the best possible overview of the processes taking place and to unravel the mechanisms of the phase transitions. In fact, XAS is an ideal technique for studying disordered systems since it does not require long range periodicity while long-range correlations and possible occurrence of crystalline phases are detected by x-ray diffraction (XRD).

Initial measurements were carried out on amorphous and liquid elemental Selenium and Germanium under HP-HT conditions. First results about crystallization/melting dynamics and structural changes across the melting lines will be discussed.

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