Developments for the *in situ* study of high P-T fluids and melts at the Diamond Light Source

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High P-T fluids and melts are key actors of the Earth deep volatile cycle as their release from the subducting slab, followed by hydrous melting of the mantle wedge and arc volcanism enables the return to the surface of a significant portion of initally subducted volatiles [1,2]. However, their composition and properties remain elusive as these very mobile phases are only sampled as rare inclusions in exhumed metamorphic rocks and are difficult to reproduce and analyze in the laboratory [3].

In the last 20 years, the development of dedicated experimental designs combined with synchrotron radiation have, however, allowed to develop the *in-situ* study of fluids and melt properties (composition, speciation, density) directly at the high P-T conditions relevant to their formation and circulation in subduction zones [4,5].

Here, we wish to present two new experimental set-ups that have been implemented on the I15 and I20-EDE beamlines at the Diamond Light Source (UK) to enable *in-situ* characterization of high P-T fluids and melts up to 1000 °C and 3-4 GPa with X-ray absorption (XAS) and diffraction (XRD) techniques. The *in-situ* measurements rely on a modified Bassett-type hydrothermal diamond-anvil cells (HDAC) [6] that enable a wider angle of collection (78°) and hence simplified geometry. First applications include the *in-situ* monitoring of high-pressure melting of PbSi glasses, the determination of the density of PbSi and NS2 glasses and the investigation of the aqueous speciation of Zn in subduction zone fluids.

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