Trace element speciation in silicic melts at high pressure

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Trace element ratios and compatibility between crystal/melt phases are used extensively in petrogenetic modelling, from isotope dating to the identification of the melt source in different geological regimes. However, the degree to which these ratios change and are influenced *in situ* by melt structure at high pressure (P) and temperature (T) is poorly constrained. Understanding chemical transfers between Earth's reservoirs requires characterisation of the structural properties of molten silicates *in situ*, at the equilibrium P-T conditions of melt genesis. It is well known that partition coefficients are dependent on P, T and compositional changes in the crystalline structures; more recent studies also show the significance of melt structure on compatibility. However, structural changes within the melt and their influence on trace element bonding have not yet been monitored *in situ*. Understanding P-T effects on partitioning directly within the melt will provide us with a more precise model for how trace elements partition within the mantle at high P-T.

Here we present the first results of *in situ* X-ray diffraction experiments on the speciation of trace elements Hf and Lu in hydrous haplogranite glass and melt up to 7 GPa and 750ºC. High P-T conditions were generated by resistive heating diamond anvil cells. This composition is particularly relevant to subduction zones and continental crust genesis. This is the first study where trace elements have been identified in silicate glasses and melts using X-ray diffraction, and provides a promising method for monitoring trace element coordination change within silicate melts at mantle P-T conditions.