ESRF	**Experiment title:** Sr complexation in magmatic fluids at high pressure and temperature	**Experiment number:** EC486
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Report:
This is the first attempt to study the complexation of Sr in aqueous and chloridic fluids equilibrated with haplogranitic melts with varying alumina saturation index (ASI) in-situ at elevated P-T conditions using hydrothermal diamond-anvil cells (HDAC). RIXS and XANES spectra in fluorescence mode were recorded using a high-resolution wave-length dispersive spectrometer. A few model compounds were recorded in transmission mode. The measurements were done using different monochromator crystals, Si311 to collect high resolution spectra, and Si111 for higher intensities especially for samples with low Sr concentrations ($\sim$ 1000 ppm Sr or smaller).

First, XANES, EXAFS, and RIXS measurements on Sr-bearing peralkaline and peraluminous glass, minerals (plagioclase, apatite) and chemical compounds ($SrCl_2{\cdot}6H_2O$, $Sr(OH)_2$ and $SrCO_3$) were performed to provide insight into the spectral dependence on the nearest and next-nearest neighbor elements surrounding Sr in various well known environments. Secondly, chloride and hydroxide standard solutions with high Sr concentrations were loaded in the HDAC and, XANES and RIXS spectra were collected at different temperatures and pressures to observe temperature dependent changes in the spectra for comparison to the spectra of the unknown samples. Finally, an aqueous or chloridic solution and a peralkaline or peraluminous glass chip were loaded in the HDAC and heated to $750-800°C$ for complete dissolution of the silicate melt. In these cases, only XANES spectra are collected.

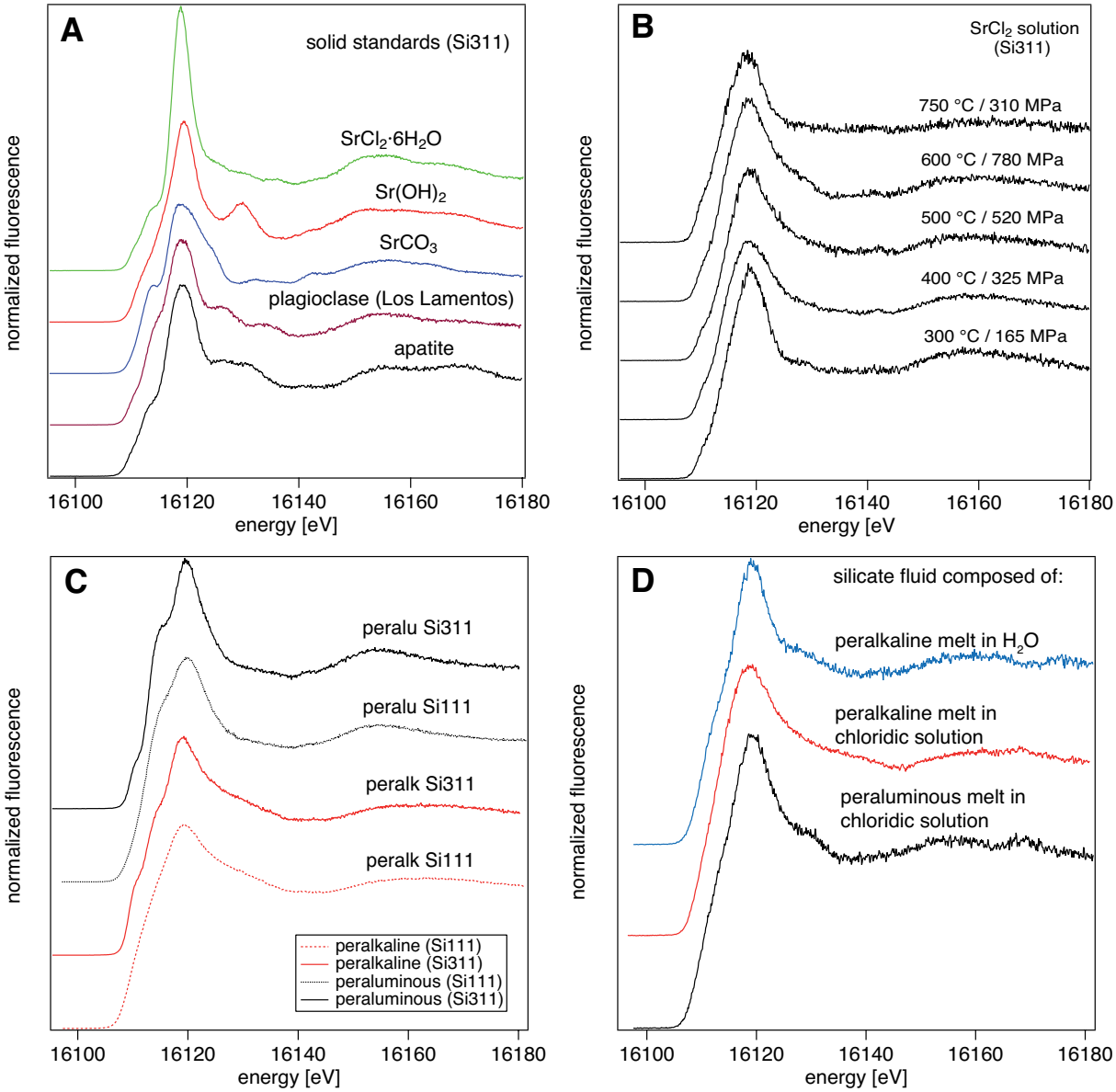

Fig. 1: XANES spectra of Sr for solid standards (**A**, high resolution), a $SrCl_2$ solution at various temperatures (**B**, high resolution spectra), peralkaline and peraluminous glasses (**C**, high and low resolution), and peralkaline and peraluminous samples (**D**, low resolution).

Figure 1 shows XANES spectra of Sr in various environments. Figure 1**A** displays high resolution spectra of solid standards. Temperature dependent changes in the XANES spectra of Sr in a $SrCl_2$ solution are shown in Fig. 1**B**. The high and low resolution spectra of the peralkaline and peraluminous glasses are presented in Fig. 1**C**. The XANES spectra of Sr in chloridic solutions equilibrated with peralkaline or peraluminous melts (Fig. 1**D**) show distinct differences. While the spectra of the peralkaline solution and peralkaline glass are very similar, that of the peraluminous solution distinctly differs from the spectrum of the peraluminous glass. This observation clearly points to the formation of different Sr complexes as a function of the melt composition (alumina saturation index).

In conclusion, the preliminary results clearly demonstrate that it is possible to obtain information on the complexation of Sr in aqueous fluids at high temperature and pressure using XAFS techniques. The spectra already indicate that Sr-complexation is very sensitive to the chemical composition of the system.