ESRF	**Experiment title:** Structural relaxation in liquid and undercooled aluminium	**Experiment number**: HD-641
Beamline: ID28	**Date of experiment**: from: 07/02/2013 to: 12/02/2013	**Date of report**: 2/05/2013
Shifts: 15	**Local contact(s)**: M Krisch	*Received at ESRF:*

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Report:

This proposal aimed to follow the structural relaxation dynamics of liquid aluminium into the undercooled state at the structure factor maximum. The gas-jet levitation set-up from the CNRS Orleans group was utilized. Structural relaxation times should be extracted from the data. The aim is to identify and follow a supposed slow process, which is thought to be at the origin for structural freezing, deep into the undercooled state.

The gas jet-levitation set-up was installed without any problems on the beamline. The safety interlock system for the laser was in place. The photo shows how the sample chamber was mounted in the beam. At this stage of installation the nozzle can bee seen, the pyrometer and some optics to bring in the heating power from the CO_2 lasers.

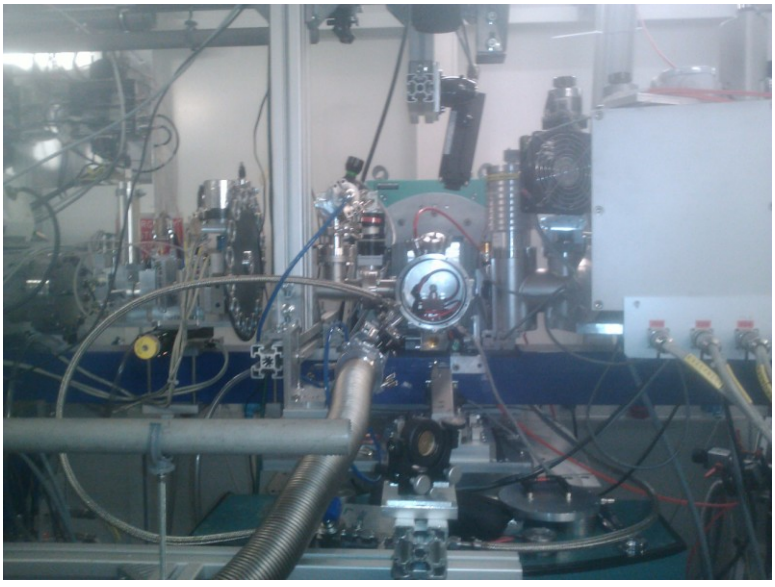

Fig 1: The photo shows part of the mounted levitation equipment during the installation procedure. In the center of the picture the sample chamber with the nozzle can be seen. Left to the picture the lasers are mounted.

Stable levitation of the sample (a 2mm sphere of pure aluminium) was immediately achieved. Switching on the laser power the sample melted within a short time. Inelastic scans have then been taken for several temperatures, ranging from the melting point 933 K up to 1300K.
Fig 2 shows a normalised energy spectrum on a logarithmic scale at the structure factor maximum of liquid aluminium. The temperature was 940 K. Included is a fit with a single Lorentzian convoluted with the measured resolution function of this analyser arm. As expected the description with a single Lorentzian is quite good, but not perfect. This fact is evidence for a further relaxation process, which should increase with lowering the temperature.

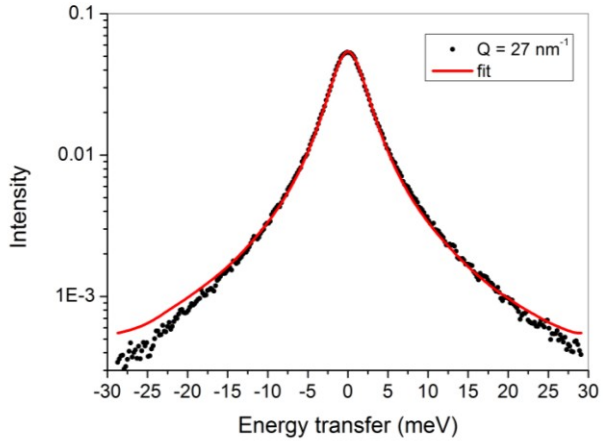

Fig 2: A spectrum at the structure factor maximum of liquid aluminium is shown with a fit. The temperature was 940 K.

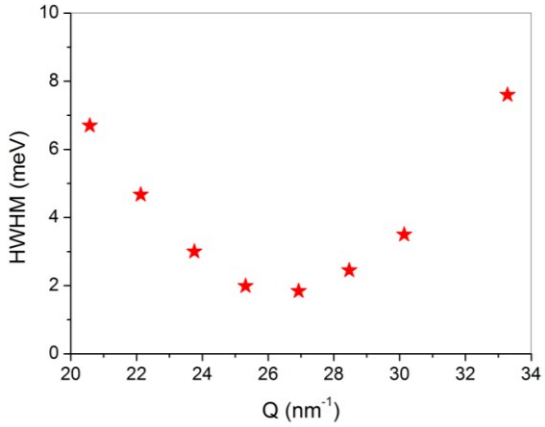

Fig 3: The HWHM from fits to a measurement near the melting point is shown.

With the 8 operational analyser arms several spectra around the structure factor maximum have been recorded simultaneously. Fig 3 shows the half width at half maximum of one scan near the melting point which demonstrates nicely the celebrate deGennes narrowing around the structure factor peak of liquid aluminium at Q_0= 27 nm^{-1}.

Attempts to undercool liquid aluminium failed, probably due to remaining oxides on the sample. The photo shows a picture of the hot levitating aluminium sample where an oxide island seems to float on the surface (white area on the sphere).