Standard Project

Experimental Report template

Proposal title: Resistance upset welding of Oxide Dispersion Strengthened steel fuel claddings		**Proposal number:** 20160111 02-01-863
Beamline: D2AM	**Date(s) of experiment:** from: 03/12/2015 to: 06/12/2015	**Date of report:** 19/08/2016
Shifts: 9	**Local contact(s):** Frédéric De Geuser	*Date of submission:*

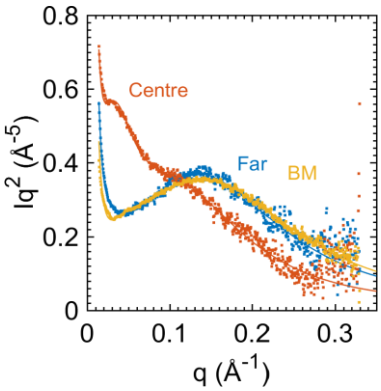
Objective & expected results (less than 10 lines):

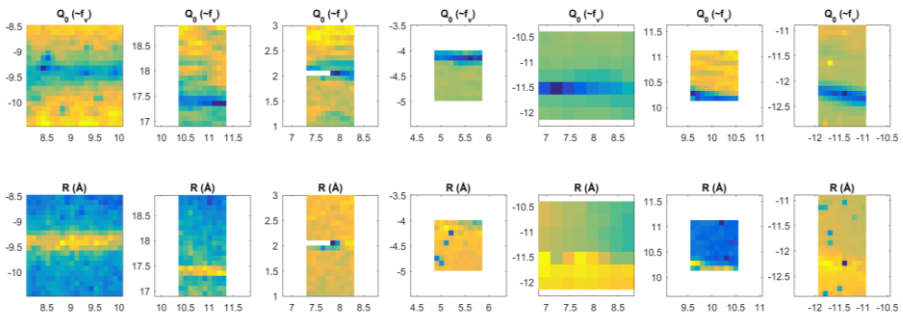
This study attempted to better understand the influence of the resistance upsed welding process parameters (force, intensity, time) on the nano oxides formed in ODS steel fuel cladding.To this effect we performed microstructure mapping by raster scanning the sample with the beam and recording the SAXS signal at each position.

Results and the conclusions of the study (main part):

We used a beam dimension of about 100µm. The beam energy was just below Y edge (~17keV). On some samples we measured the SAXS signal at different enrgies below the Y edge to gather information on the Y content of the nano-objects. The beam positioning on the region of interest was rather complex due to the small dimensions of the samples, but proved to be doable with the help of transmitted beam monitor.

We studied a total of 18 samples (2 different steel compositions 9Cr and 14Cr and 9 different sets of process parameters). The number of SAXS patterns on each microstructure map was between 100 and 1000 images, depending on preexistion information on the dimensions of the affected zone.





The SAXS patterns above are selected states on a given sample showing the difference between the centre of the weld and the base material, as well as the reproductibility of the base microstructure. The maps on the right are example of microstructure maps obtained (volume fractions on top, size at the bottom, dimensions are mm). These objects are challenging to observe no matter which technique you employ, but with SAXS mapping, we manage to unravel the distribution of the nanooxides (size and fraction) with an excellent spatial resolution.

Justification and comments about the use of beam time (5 lines max.):

The beamtime was fully exploited with the measurements of 19 microstructure mapping, many of them at 6 different energies. The use of the beamline was essential for energy tuning, beam size, intensity.

Publication(s):
At least one high quality paper is under preparation.