ESRF	**Experiment title:** in-situ Anomalous Small Angle Scattering study of precipitate composition evolution in Al-Zn-Mg-Cu alloys during heat treatments	**Experiment number**: MA343
Beamline: ID01	**Date of experiment**: from: 29.08.2007 to: 03.09.2007	**Date of report**: 04.02.11
Shifts: 15	**Local contact(s)**: F. Bley	*Received at ESRF:*

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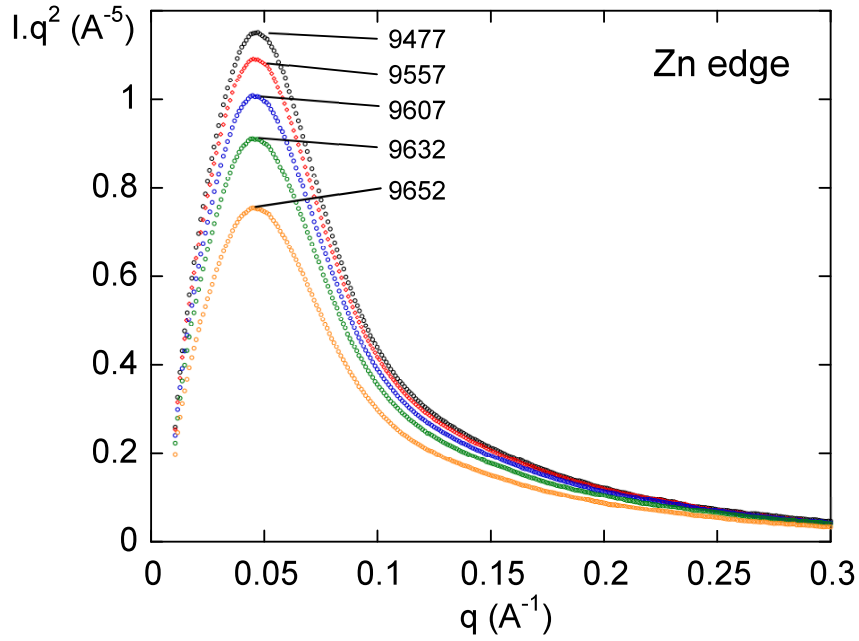
Report:

Anomalous SAXS was used to evaluate in-situ the evolution of precipitate composition during heat treatments in three alloys of the Al-Zn-Mg-Cu family used in aerospace applications. In fact, the main precipitates in this system show a substitution of Zn and Cu, and it is important to know how the solute is ditributed between the matrix and the precipitates along the heat treatments, as it can influence particularly the alloy's corrosion resistance.
The ASAXS signal was recorded in-situ during ageing at 160°C simultaneously on the three alloys that were placed together iun the furnace, and at two K-edged, namely Cu and Zn, which are both present in the nanoscale precipitates.
This experiment was extremely successful and enabled to determine with very little variations in the experimental procedure (since the three alloys were evaluated together) the effect of ally content and heat treatment on the precipitate composition evolution. The precipitate composition was determined with some hypothesis made on the other solue contents (Mg & Al), based on Atom Probe Tomography observations made on selected samples.
Also, many ex-situ ASAXS experiments were carried out, in order to investigate the effect of temperature on precipitate composition, and

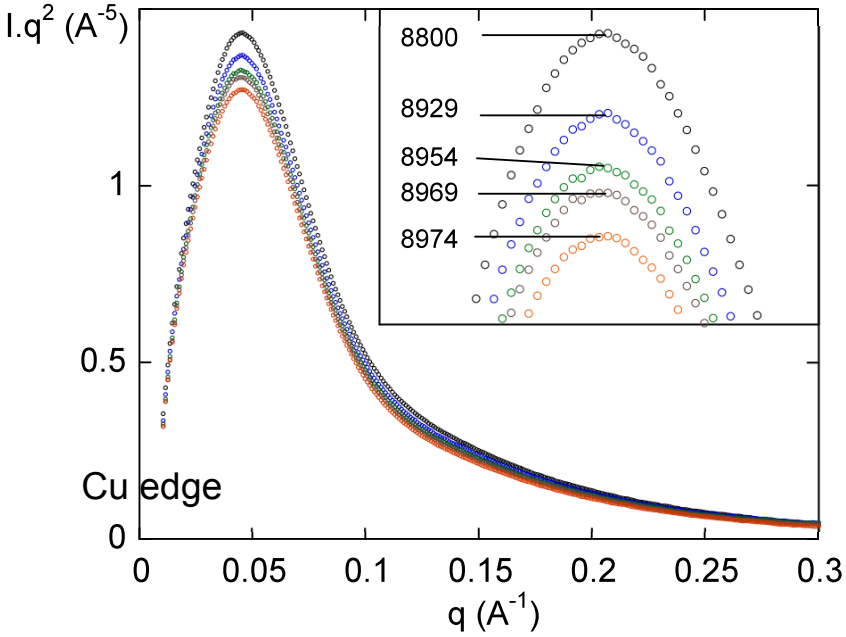
The main result was that the precipitates showed almost no Cu in the initial stages of precipitation, with however a high concentration in Zn, whereas Cu integrated progressively the precipitates in later stages, in relation with its slower diffusivity in the Al matrix.

For more details refer to the publication that has been written subsequently to this experiment :

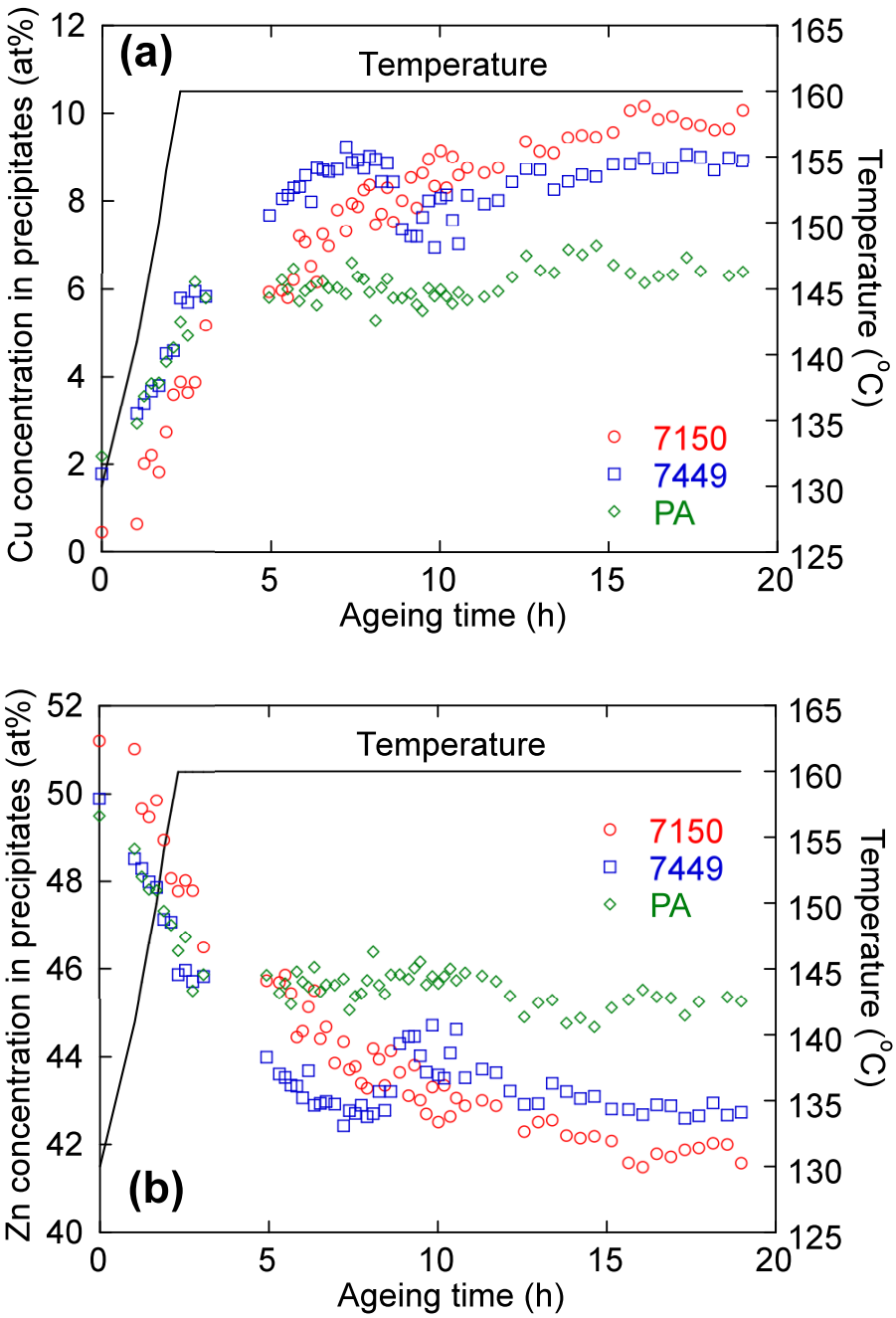
Marlaud T, Deschamps A, Bley F, Lefebvre W, Baroux B. Acta materialia 2010;58:248-260.



Example of the evolution of the SAXS signal close to the Zn edge



Example of the evolution of the SAXS signal close to the Cu edge



Evolution of the precipitate composition in Cu and Zn during ageing at 150°C for the three alloys studied.