ESRF	**Experiment title:** ***Determination of the most suitable container for the study of the liquid atomic structure of Mg based metallic glasses***	**Experiment number**: **16-01- 719**
Beamline: BM16	**Date of experiment**: from: 07/11/2008 to: 09/11/2008	**Date of report**: 30/08/09
Shifts: 6	**Local contact(s)**: Ana Labrador	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

D. Crespo*, P. Bruna*, J. Serrano

Dep. Física Aplicada, EPSC, Universitat Politècnica de Catalunya, Av. Canal Olimpic 15, E-08860 Castelldefels, Spain

E. Pineda, T. Pradell: Dep. Física e Enginyeria Nuclear, ESAB, Universitat Politècnica de Catalunya, Av. Canal Olimpic 15, E-08860 Castelldefels, Spain

A. Labrador*: BM16, ESRF and CELLS

Francisco javier Martinez casado*: BM16, ESRF

Report:

The aim of the experiment was to determine which were the most suitable experimental configuration for the study of the liquid atomic arrangement of Mg-based metallic glasses. Several samples were produced with the melt spinning technique obtaining ribbons with an approximate thickness of 30 microns. These ribbons were pulverized by hand in an Ar atmosphere inside a glove box and placed inside quartz capillaries with diameters of 1 and 2 mm. The produced compositions were the following:

Mg70Zn30
Mg80Zn20
Mg75Zn25
Mg65Zn35
Mg58Cu42
Mg83Cu17
Mg85.5Cu14.5
Mg88Cu12
Mg8Zn92
Mg60Zn40

All the measurements were performed with an energy of 16 KeV and the diffraction spectra were collected using a 2D detector with transmission geometry. The samples were introduced in a linkam hot stage to melt the ribbons and perform the measurements in the liquid state, as

well as in the glassy state. The temperature was varied between room temperature and 500 ºC.

Depending on the composition we were able to melt the ribbon but obtaining a liquid that absorbed all the x-rays. The composition for which we obtained the best results was the Mg70Zn30. Figure 1 shows the diffracted intensity obtained during the annealing of the Mg70Zn30 alloy. The initial glassy state is decomposed in crystalline phases through two crystallization processes at different temperatures, until the melting of the sample is eventually observed.

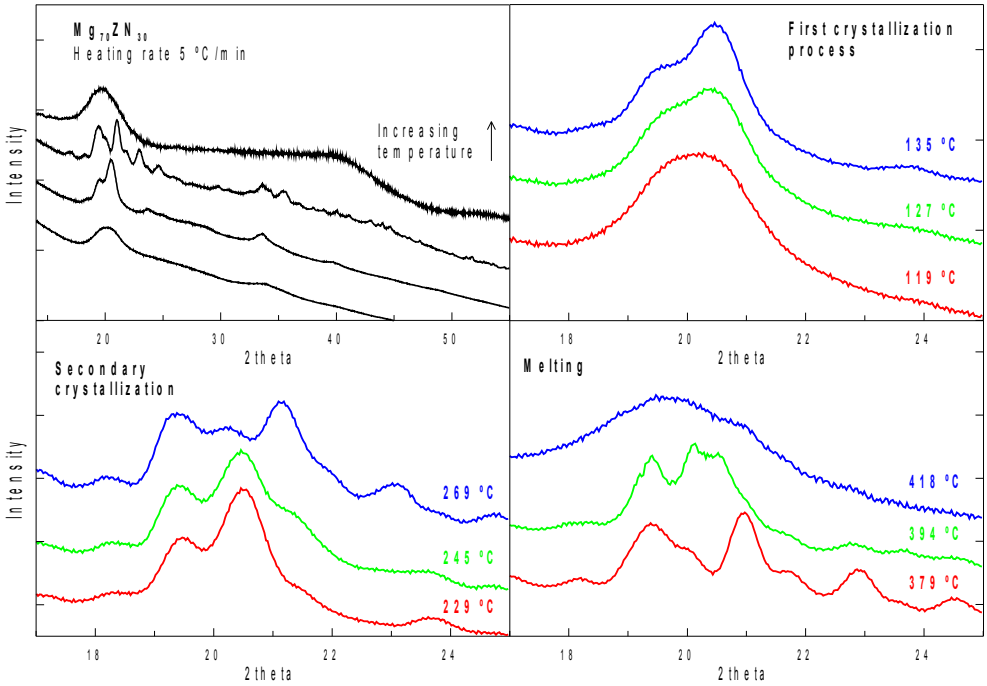

Figure 1. Diffraced X-ray intensity of Mg70Zn30 alloy inside a capillary quartz of 1mm diameter. The sample was annealed from room temperature up to 500 ºC.

These results demonstrated the feasibility of the experimental setup, however, the penetrating length of the radiation and the maximum momentum transfer Q_{max} available in BM16 (E<17 KeV) do not allow us to obtain diffraction spectra with enough quality to perform the required corrections for the determination of the liquid atomic structure of these class of materials.

Proposals in high-energy beamlines are currently being submitted in order to continue this experiment with the main purpose of studying systematically different alloys and find differences between their local ordering process when decreassing temperature, thus allowing the validation or rejection of the current theoretical models for determining the glass forming ability of metallic glasses.