ESRF	**Experiment title:** Dynamic signatures of pressure induced polyamorphism in Ce55Al45 metallic glass	**Experiment number**: HD-349
Beamline: ID28	**Date of experiment**: from: 23/07/2009 to: 29/07/2009	**Date of report**: 02/02/2011
Shifts: 18	**Local contact(s)**: Roberto Verbeni	*Received at ESRF:*

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Report:

Polymorphic transitions induced by pressure are known in Ce-based compounds. $Ce_{55}Al_{45}$ is a marginal glass-former which showed for the first time poly*a*morphism in metals, Sheng et al. [Nature materials 6, 192-197, 2007] reported a transition between a low density and a high density amorphous phases between 2.0 and 13.5 GPa. The original aim of the proposal was to follow possible changes in the collective dynamics of this material during the pressure-induced transition. Preliminiary X-ray diffraction (XRD) measurements of the samples were performed in BM16 beamline at ESRF, these measurements showed the convinience to use a better glass-forming composition: $Ce_{70}Al_{10}Ni_{10}Cu_{10}$. This material was not previously checked in high pressure experiments, but it was likely to show polyamorphism at high pressures because of the high content in Ce.

The obtained results confirm a polyamorphic phase transition upon application of pressure. The static structure factor show a hysteresis cycle on the pressure dependence and a change of specific volume similar to the one reported on $Ce_{55}Al_{45}$ metallic glass (See figure1). Inelastic X-ray Scattering results (figure 2) show a rather small change in the acoustic sound velocity related to the hysteresis. However, a significant change in acoustic frequencies at half the wavenumber corresponding to the first band in the static structrue factor is observed. This both signatures are compatible with the polyamorphic transition.

For the first time, the acoustic properties and collective dynamics of amorphous metals have been studied during a polyamorphic transition. These results will give important information on how metallic glass properties are sensitive to changes in the amorphous structure.

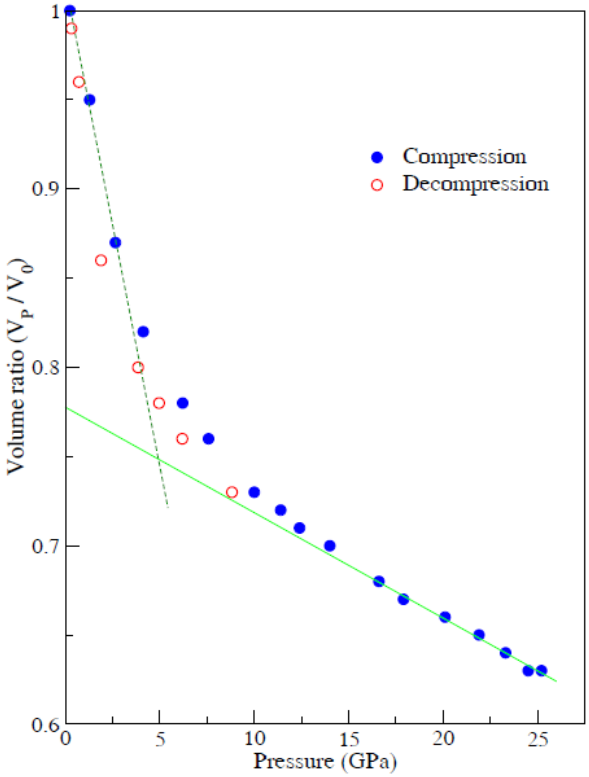

Figure 1

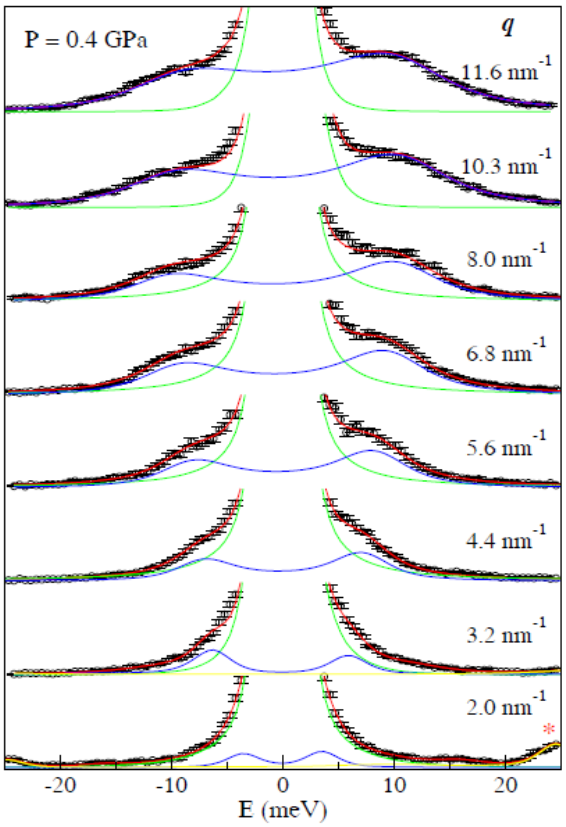

Figure 2

Publications:

‘Polyamorphic transitions in Ce-based metallic glasses by synchrotron radiation’
Duarte, MJ; Bruna, P; Pineda, E; Crespo, D; Garbarino, G; Verbeni, R; Zhao, K; Wang, WH; Romero, AH; Serrano, J
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