

## LOCAL ATOMIC ORDER IN Zr-Cu METALLIC GLASSES STUDIED BY X-RAY ABSORPTION FINE STRUCTURE METHOD

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Results of the Extended X-ray Absorption Fine Structure (EXAFS) measurements of Zr-Cu amorphous alloys are presented. The samples of investigated alloys were obtained by rapid quenching of liquid using the melt-spinning technique. The EXAFS experiments were carried out for  $K_{Zr}$  and  $K_{Cu}$  absorption edges in a transmission mode at liquid nitrogen temperature. The local environment of Zr and Cu atoms was studied in a wide composition range. From the experimental data the values of interatomic distance, mean square variation in bond length (Debye-Waller factor) and coordination number were calculated. The EXAFS spectra were used to evaluate the pair distribution functions (PDFs) [1]. The concept of ideal solution behaviour in Zr-Cu glasses [2] was applied to the resulting PDFs. The structural data are correlated with the thermal stability results derived from differential scanning calorimetry (DSC) experiments.

The effect of deformation and thermal annealing on the local environment of the atomic species is demonstrated. In the heavily deformed samples a clear decrease of the coordination number is observed indicating that additional free volume was introduced to the amorphous structure during deformation. The structural similarities between the local structure of the glassy phase and their crystalline equivalents are demonstrated.

### References

- [1] J. Antonowicz, D.V. Louzguine-Luzgin, A.R. Yavari, K. Georgarakis, M. Stoica, G. Vaughan, E. Matsubara, A. Inoue, *J. Alloys Compds.* **471** (2009) 70.
- [2] K. Georgarakis, A. R. Yavari, D. V. Louzguine-Luzgin, J. Antonowicz, M. Stoica, Y. Li, M. Satta, A. LeMoulec, G. Vaughan, A. Inoue, *Appl. Phys. Lett.* **94** (2009) 191912; *ESRF Highlights* 2009, p.40.

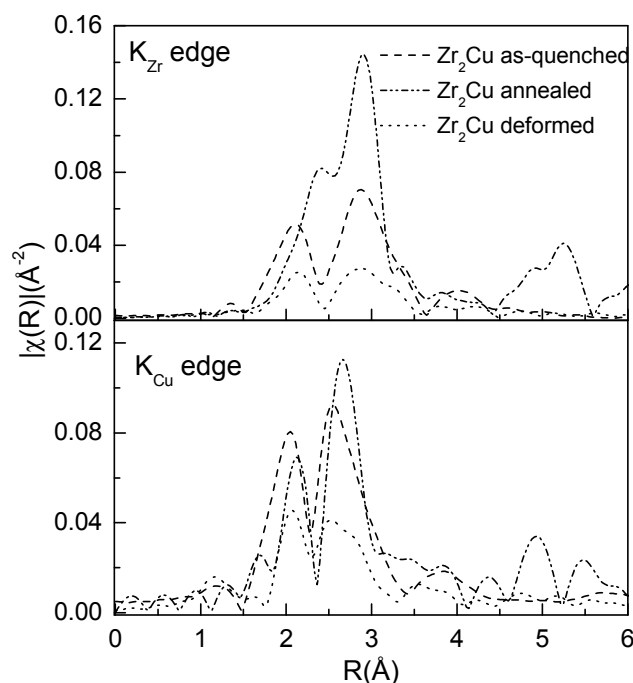


Figure 1. Fourier transformed K-edges of Zr and Cu for  $Zr_2Cu$  amorphous alloy in the as-quenched, deformed and annealed (crystalline) state.