Experimental structural study of metallic glasses

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Atomic structure of metallic glasses is a key factor determining their physical properties and, respectively, practical applications. In most cases, metallic glasses are complex, multi-component systems, which essentially limits possibilities of the structural investigations, in particular, on the level of partial pair distribution functions and corresponding structural parameters. According to the standard methods of analyses of disordered structures [1], for an n-component system, $n(n + 1)/2$ independent diffraction experiments are needed to determine all the $n(n + 1)/2$ pair distribution functions. In this contribution, we will show on the example of Ni-Zr, Cu-Zr and Cu-Zr-Al metallic glasses how the chemical and topological short- and medium-range atomic order can be resolved by combination of different experimental techniques such as X-ray diffraction, neutron diffraction with isotopic substitution, and X-ray absorption spectroscopy in the framework of the reverse Monte-Carlo simulation technique [2].

[1] Y. Waseda, *The structure of non-crystalline materials: liquids and amorphous solids*. McGraw-Hill, New-York, 1980.
[2] I. Kaban, P. Jóvári, V. Kokotin, O. Shuleshova, B. Beuneu, K. Saksl, N. Mattern, J. Eckert, A.L. Greer, *Local atomic arrangements and their topology in Ni-Zr and Cu-Zr glassy and crystalline alloys*. Acta Mater. 61 (2013) 2509-2520.