Short-range structural order in Zr-based multi-component glasses, using XAFS

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Abstract:

We have investigated the short-range-order of Zr69.5Cu12Ni11Al7.5, Zr41.5Ti41.5Ni17 and Zr67Ni33 metallic glasses, using X-ray absorption spectroscopy. The glass-forming-abilities of these alloys degrade as: Zr41.5Ti41.5Ni17 > Zr69.5Cu12Ni11Al7.5 >> Zr67Ni33. While inferior glass formation ability of binary alloy is understandable from confusion principle, better glass formation ability of Zr41.5Ti41.5Ni17 than Zr69.5Cu12Ni11Al7.5 is paradoxical. We try to resolve this paradox from the structural difference between the glassy phase of the alloys. Our results establish that vast structural difference exists between binary and multi-component alloys, following conventional wisdom. In contrast, the structure of the two multi-component alloys is similar. We incite the importance of Ni-Ti chemical interaction in resolving their glass formation ability difference.

References:

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