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Topological Instability and Glass Forming Ability in the Ti-Ni-Cu System

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The topological instability *lambda* criterion, which was proposed to predict the crystallization behavior of amorphous Al-based alloys [1] has been also successfully used to reproduce the compositional ranges where binary and ternary bulk metallic glasses (BMGs) are obtained [2]. The good glass-former composition(s) are expected to be within fields of mutual and simultaneous topological instability of all the crystalline phases competing with glassy phase and therefore, it is possible to identify the compositions with the minimum values of *lambda* in each composition field of interest. We also combine the *lambda* criterion with a new factor [3], the electronegativity difference among the elements (*Delta* e) in each particular composition, which is related to the formation enthalpy (*Delta* H) and therefore to the glass stability of the alloy, to indicate the compositions which are expected to show the best glass forming ability. In the present work the topological instability criterion combined with the electronegativity difference between the components of the alloys was applied to the Ti-Ni-Cu system to calculate composition maps which allowed the identification of compositions presenting good GFA. The calculated results compared well with the glass forming ability of reported alloys, as measured by thermal stability against crystallization, and indicated new compositions with the largest supercooled liquid range reported so far.

References

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