Effect of Icosahedral Short-range Order on the Undercoolability of Ti-Zr-Ni Liquid Alloys

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— Icosahedral short-range order (ISRO) in metallic liquids leads to a high nucleation barrier for crystal phases and is, therefore, an important factor for determining the amount of undercooling. High energy (125 keV) x-ray diffraction studies were made on electrostatically levitated Ti-Zr-Ni liquids that form the solid solution phase, β(Ti/Zr), the icosahedral quasicrystal (i-phase), and a polytetrahedral C14 Laves phase to correlate undercooling with the short-range order in the liquid phase. The undercoolability increases with increasing Ni concentration for liquids that form the β(Ti/Zr) and C14 phases. The maximum ISRO and minimum undercooling is found for the liquid that crystallizes to the i-phase. These data are presented and discussed in terms of a local cluster model for the liquid.

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