

EFFECT OF MISCHMETAL ON THE GLASS FORMING ABILITY, THERMAL STABILITY AND CRYSTALLIZATION BEHAVIOR OF AMORPHOUS AL90-XNI10MMX (X=2-8) ALLOYS

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Abstract

Amorphous Al90-xNi10MMx (MM: Mischmetal; x=2-8) alloys were prepared by melt spinning and their thermal stability, glass forming ability and mechanism of crystallization were studied. The effect of MM content on the crystallization process was elaborated by thermal analysis. The apparent activation energy of the first crystallization stage increased from 137±5 kJ/mol for Al88Ni10MM2 to 387±12 kJ/mol for Al83Ni10MM7, indicating higher thermal stability of the amorphous alloys containing higher MM concentrations. A change in the crystallization mechanism from diffusion control with zero nucleation rate (for MM=2 at. %) to nucleation and growth mechanism with increasing nucleation barrier (for MM=7at. %) was also noticed. Moreover, the Al-Ni alloys containing up to 4 at.% MM exhibited nanocrystallization without clear glass transition temperature while at higher MM concentrations, the alloys showed a glassy state having a glass transition temperature with higher thermal stability.

Keywords: Glasses, metallic, phase transformation, thermal stability, calorimetry, diffraction

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