

Microstructure of rapidly quenched Fe-Cu-based alloys with liquid miscibility gap

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Abstract

Microstructural characterization of the Fe-Cu-based multi-component alloys revealing liquid miscibility gap is presented. A special attention was paid to effect of the melt ejection temperature on the microstructure of resultant ribbons. Increase of the melt ejection temperature enabled formation of amorphous-crystalline composite if homogeneous melt temperature was achieved. Rapid cooling from the miscibility gap region, on the other hand, resulted in presence of non-uniform, banded microstructure. The microstructure of melt-spun ribbon can be also modified by slight change of the chemical composition within the miscibility gap range. Matrix and precipitates can constitute either the Fe-rich amorphous or the Cu-rich crystalline phase, depending on the chemical composition.

Detailed studies of the microstructure, involving scanning and transmission electron microscopy, proved amorphous nature of previously existing the Fe-rich melt and crystalline structure of the Cu-rich melt.