

The structure and magnetic properties of rapidly quenched Fe₇₂Ni₈Nb₄Si₂B₁₄ alloy

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Abstract:

In this work, the influence of heat treatment process on structure and magnetic properties for rapidly quenched Fe₇₂Ni₈Nb₄Si₂B₁₄ alloy are reported. Firstly, for amorphous ribbons the onsets of crystallization process for bcc-Fe type phase (primary crystallization) and bct-Fe₃B type phase (secondary crystallization) are defined by thermal analysis using heating rate of 10°C/min. Then basing on measured values the classical heat treatment process (with heating rate 10°C/min) in vacuum for wound toroidal cores is optimized to obtain best soft magnetic properties (B(H) dependencies and magnetic core loss Ps) at frequency 50 Hz. For heat treated samples the X-ray diffraction method is used to determine the unit cell parameters of bcc-Fe type nanocrystallites as well as their average crystallite size. Therefore, for optimal heat treated sample the complex magnetic permeability in the frequencies 106 -109 Hz for temperature range from -50°C to 100°C is measured and in the frequencies 104 -108 Hz at room temperature.

Key words:

Metallic glass, soft magnetic materials, material characterization