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