Title: Structure modification and recovery of amorphous $Fe_{73.5}Si_{13.5}B_9Nb_3Cu_1$ magnetic ribbons after autoclave treatment: SAXS and Thermodynamic analysis

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PII: S1005-0302(18)30186-5
DOI: https://doi.org/10.1016/j.jmst.2018.09.010
Reference: JMST 1296

To appear in:

Received date: 3-1-2018
Revised date: 5-3-2018
Accepted date: 10-4-2018

Please cite this article as: Guo LY, Wang X, Shen KC, Kim KB, Lan S, Wang XL, Wang WM, Structure modification and recovery of amorphous $Fe_{73.5}Si_{13.5}B_9Nb_3Cu_1$ magnetic ribbons after autoclave treatment: SAXS and Thermodynamic analysis, *Journal of Materials Science and amp; Technology* (2018), https://doi.org/10.1016/j.jmst.2018.09.010

Structure modification and recovery of amorphous $Fe_{73.5}Si_{13.5}B_9Nb_3Cu_1$ magnetic ribbons after autoclave treatment: SAXS and Thermodynamic analysis

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[Received 3 January 2018; Received in revised form 5 March 2018; Accepted 10 April 2018]

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Abstract

The structure, crystallization kinetics and magnetic property of as-quenched $Fe_{73.5}Si_{13.5}B_9Nb_3Cu_1$ amorphous ribbon (R0) as well as ribbons after autoclave treatment at 100 ºC and 150 ºC (R1 and R2) have been systematically studied by various techniques. With increasing autoclave treatment temperature, the measured structural, kinetic and magnetic parameters of samples increase firstly, i.e. R0 < R1; and then decrease or recover to the as-quenched sample, i.e. R2 < R1 or R2 $\approx$ R0. These results indicate that the SROs in R1 samples increased by transforming from fcc to bcc structure during the autoclave treatment and that the autoclave treatment can decrease the large radius (r_M) MRO (medium range order), but increase the small r_M MRO. The measured structural, thermal and magnetic parameters of R2 sample have a tendency to recover toward as-quenched R0 sample. The thermal and magnetic parameters of samples after solely annealing treatment at higher temperature have no obvious recover phenomenon. The uneven actions of pressure and