THERMAL EXPANSION OF NANOPERM-TYPE ALLOYS FROM IN-SITU X-RAY DIFFRACTION

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NANOPERM-type alloys with nominal compositions of $(Fe_{1-x}Co_x)_{79}Mo_8Cu_1B_{12}$ and $(Fe_{1-x}Co_x)_{76}Mo_8Cu_1B_{15}$ (x = 0 and 0.5) were prepared in a form of 6 mm wide and about 20 μm thick ribbons by single-roller melt-spinning technique. Room temperature Mössbauer (MSB) effect experiments on as-prepared amorphous ribbons were carried out in transmission geometry using a ^{57}Co/Rh source mounted on a constant acceleration driving system. Temperature evolution of the as-quenched ribbons during constant-rate heating (10 °C/min) was continuously followed using a high-energy (88 keV) X-ray diffraction (XRD), performed on the ID11 undulator beamline at the ESRF (Grenoble, France). MSB spectroscopy and XRD confirm amorphous nature of melt-spun ribbons. Furthermore, MSB reveals significant change of magnetic state of the as-quenched precursors when substituting of Fe by Co (x=0.5). Analysing series of XRD patterns in a reciprocal space yields thermal expansion of amorphous alloys providing insight about the thermally activated effects such as relaxation and crystallization.

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