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Solid state amorphization transformation in the mechanically alloyedFe27.9Nb2.2B69.9 powders

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Abstract: Mössbauer spectrometry and Rietveld analysis of X-ray diffraction patterns were used to follow the solid state amorphization transformation during the milling process of the Fe27.9 Nb2.2 B69.9 powders. The reaction between elemental Fe, Nb and B powders leads to the formation of the Nb(B) and Fe(B) solid solutions after 1 and 10 h of milling, respectively. A mixture of -Fe, Nb(B) and highly disordered Fe(Nb, B) solid solution is found after 25 h of milling. An amorphous structure is obtained on further milling time (100 h). From the Mössbauer spectrometry results, it is observed that the total mixing of the elemental powders, at the atomic level, is achieved after 50 h of milling and a stationary state corresponding to a full paramagnetic amorphous phase is reached after 100 h of milling. The amorphization process can be described by an Avrami parameter close to n = 1.

Keywords : Nanostructures Powder metallurgy X-ray diffraction Mössbauer effect