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Structure and Magnetic Properties of Ternary Nanosized FeAlSn and CuFeCo Powders Synthesized by Mechanical Milling

Z. Hamlati, W. Laslouni, Mohammed AZZAZ, M. Zergoug, D. Martínez-Blanco, J.A. Blanco, P. Gorria

Abstract: Ternary Fe72Al26Sn2 and Cu70Fe18Co12 alloys were obtained by mechanical alloying of pure Fe, Al, Sn, Cu and Co powders using a high energy ball mill. X-ray diffraction and electron microscopy supported by magnetic measurements have been applied to follow changes in the microstructure, phase composition and magnetic properties in dependence on milling time. With the increase of milling time all Al and Sn atoms dissolved in the bcc Fe and the final product of the MA process was the nanocrystalline Fe (Al, Sn) solid solution in a metastable state with a large amount of defects and mean crystallite size of 5 nm. However, the obtained crystallite size value is about 10 nm for the ball milled Cu70Fe18Co12 powders. The electron microscope observations show the morphology of powder particles. Magnetic properties of the nanocrystalline mechanically alloyed FeAlSn and CuFeCo were also investigated and were related to the microstructural changes.

Keywords : CuFe Solid Solution, DRX, FeAl, Mechanical Alloying, SEM, VSM