EFFECTS OF MILLING CONDITIONS ON THE STRUCTURE AND PHASE COMPOSITION OF FEMO ALLOYS

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Abstract

Iron and molybdenum powder mixture was exposed to ball milling and simultaneously to stepwise mechanical alloying using Fritsch planetary mill (Pulverisette 7) in air and in nitrogen atmosphere. X-ray diffraction, Mössbauer spectrometry, and electron microscopy have been applied to follow the changes in microstructure and phase composition in dependence on atmosphere and milling time. The analysis of room temperature Mössbauer spectra shows that the magnetic properties of the mechanically alloyed FeMo powders can be interpreted in terms of three contributions. First contribution is associated with the FeMo nanograin core, which is similar to the FeMo bulk alloy of the same composition, i.e., a ferromagnetic solid solution of Mo in Fe the lattice parameter of which changes with milling time. The second and third contributions can be interpreted as a disordered and/or highly defected intergranular zone influenced by atmosphere used during milling. These contributions are ferromagnetic and/or paramagnetic, depending probably on an amount of oxygen or nitrogen atoms influencing the formation of the FeMo+N(+O) mixture. The Rietveld interpretation of diffraction patterns and the transmission electron microscopy support well the Mössbauer results.

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