MÖSSBAUER STUDY OF MAGNETIC HYPERFINE FIELDS IN MILLED FINEMET

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9.7 cm

Excellent magnetic properties of $Fe_{73.5}Si_{13.5}Cu_1Nb_3B_9$ are a subject of great interest for last years. The preparation of this alloy as bulk is a very important problem of technology. This work is an attempt to study the properties of FINEMET powder that can be used to produce bulk samples. The initial material in a form of either amorphous ribbon or mixture of pure elements was subjected to grinding for a long time in a vibratory micromill under Ar protecting atmosphere. Transmission Mössbauer spectrometry was applied in the temperature range of -180 °C $\div$ 390 °C in order to study an evolution of structure and magnetic properties of these materials. For each case, strong changes of the magnetic hyperfine field distribution are observed, arising from strong alterations of powder sizes and structure. Both crystallisation (crystalline phase Fe(Si) with 12-13 at. % of Si was found) and repeated amorphisation takes place, depending on the milling time. The results of temperature measurements – particularly temperature evolution of Mössbauer subspectra and character of the magnetic phase transition – do not confirm a hypothesis of superparamagnetic relaxations as a source of low- and zero- field components arising in spectra. The grain boundaries and crystalline site defects seem to be very important in the last stages of milling.

13.4 cm

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