

Study of Mechanically Alloyed Nano Cu-Fe Particles With Hetero-Structure

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I. Introduction

The granular alloys with non-magnetic metallic hosts show good soft magnetic properties and giant magnetoresistance (GMR). Recently, exciting results on abnormal behavior properties of magnetic granular alloys consisting of ferromagnetic nano scaled particles such as immiscible alloy of Cu-Co and Cu-Fe, have been reported.[1-2] In particular, the magnetization curves show irreversibility in a high applied magnetic field. In particular, the magnetization curves show irreversibility in a high applied magnetic field. We obtained multiphase state of Mössbauer spectra for $\text{Cu}_{90}\text{Fe}_{10}$. In this work, the investigation of the structure and magnetism as a function of the synthesis processes and a amount of doping ratio of iron at immiscible Cu-Fe alloys, were performed.

II. Experimental Technique.

The magnetic nano particles of $\text{Cu}_{50}\text{Fe}_{50}$, $\text{Cu}_{80}\text{Fe}_{20}$ and $\text{Cu}_{90}\text{Fe}_{10}$ alloys were prepared by using mechanical alloying (MA) methods. The process of MA was carried out by milling of mixed copper and iron powders in a Fritsch planetary ball mill. A vibratory ball-mill under argon atmosphere at room temperature for 72 hours, and liquid nitrogen temperature carried out during several dozens hours.

III. Results and Discussion.

The magnetic nano particles of $\text{Cu}_{50}\text{Fe}_{50}$, $\text{Cu}_{80}\text{Fe}_{20}$, and $\text{Cu}_{90}\text{Fe}_{10}$ alloys were prepared by using mechanical alloying (MA) methods. The results of investigation show that materials from MA method on the base of $\text{Cu}_{80}\text{Fe}_{20}$, and $\text{Cu}_{90}\text{Fe}_{10}$ alloys are heterogeneous. The temperature dependent of NPD patterns of the $\text{Cu}_{80}\text{Fe}_{20}$ alloys make it possible to reveal the peculiarities of magnetization process of alloys with different synthesis methods. The initial curve of hysteresis and Mössbauer spectra can be explained by the existence of hetero magnetic structure at $\text{Cu}_{90}\text{Fe}_{10}$ particles in the process of reduction of their size.[2] It could be explained spin canted magnetic structure of particles.

References

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