CARACTÉRISATION DES NANOSTRUCTURAUX $Fe_{60}(Al_2O_3)_{40}$ et $Fe_{60-x}Co_x(Al_2O_3)_{40}$

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Soutenue en: 2018

Abstract: The nanostructured materials present more often some originals behavior, which be different considerably from those massifs materials. These materials, varying on a scale of the order of some nanometers, and appear under diverse forms according to the dimensionality. Their peculiarity is that they present under the influence of the refinement of the crystallite size, a simultaneous improvement of the magnetic, physical and mechanical properties, in comparison to those conventional materials.FeCo alloys present exceptional magnetic properties. They exhibit a high magnetic permeability, a high saturation moment and a low coercivity. And the addition of Al_2O_3 as an insulating phase can improve their properties by preventing the diffusion or agglomeration of magnetic particles and their growth.Comparing with other techniques of elaboration, mechanical alloying is a simple and effective process. It offers many advantages in the manufacture of nanostructured materials because it allows a perfect distribution of the chemical elements, an excellent control of the composition and homogeneity of the material.The aims of this work is to study the magnetic and structural properties of nanostructured powders $Fe_{60-x}Co_x(Al_2O_3)_{40}$ obtained by high energy ball milling. The morphological and structural characterization of these powders was carried out with a scanning electron microscope (SEM) and X-ray diffractometer. The evolution of these properties is verified by non-destructive techniques such as vibrating sample magnetometer (VSM) and eddy currents (CF).From a structural point of view, the results showed that the increase of the milling time (of 0 h to 30 h) of $Fe_{60}(Al_2O_3)_{40}$ powder (x=0), causes a decrease of the average crystallite size and an increase of the internal stress, On the other hand from a magnetic point of view, registering us a decrease of the saturation magnetization and an increase of coercivity. On the other hand by varying x (increase of mass percentage of Co) in powders $Fe_{60-x}Co_x(Al_2O_3)_{40}$ milled for 20 hours, the preceding parameters vary in the same direction as in the powder in x=0 but in a better way.

Keywords : Nanostructured materials, Mechanical Alloying, micro-structural and morphological properties, magnetic measurements and Eddy current