

**SYNTHESIS AND CHARACTERIZATION OF NANOCRISTALLINE FE70SI20B10 ALLOY  
PREPARED BY HIGH ENERGY BALL MILL**

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**Abstract**

Mechanical alloying is a powder metallurgy processing technique involving cold welding, fracturing, and rewelding of powder particle in a high energy. It has been used to obtain nanocrystalline alloy. Fe-20wt%Si-10wt% B alloys were synthesized using a planetary ball mill (Retsch PM400). Xray diffraction was used to identify and characterise various phase during the milling process. The nanostructured alloys obtained are characterized by several techniques, such as X-ray diffraction (XRD), which allowed the optimization of bore in silicium dissolution time in Iron. It is shown that the FeSi solid solution was formed after 4 hours milling. The study state grain size is about 10 nm. The peaks of a solids solutions seem of face centered cubic (FCC) structure Fe<sub>3</sub>Si and BCC structure FeB and FeSi for a speed of 250 rpm respectively the exploitation of the XRD patterns recorded the crystallites size of the order about 15 nm for 56 hours milling time for Fe<sub>3</sub>Si phase and about 17 nm for 24 hours milling time for FeSi phase and FeB. The scanning electron microscopes (SEM), EDX analysis have confirmed the refining of grinded particles in function of milling time and the homogenization of our powders in different parts components. Many nanostructures magnetic materials have exhibited excellent soft magnetic properties, which suit so many applications. We used the electromagnetic methods and Xray (like a reference methods), to characterize the variation of structure and their influence.

**Keywords:** Fe-Si-B powder, Mechanical alloying, nanomaterials, X ray Diffraction

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