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Influence of milling time on magnetic properties of Fe-Si nanomaterials alloy synthesized by planetary ball mill method

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Alloy powder is an essential material for various industries. It is widely used not only for various machine parts but also as a basic material in various fields. One of the methods for making such a metal alloy is a mechanical alloying method in which a metal powder is put into a container together with steel balls and ball milled with mechanical energy. In this process, the powder is repeatedly subjected to cold pressing and fracture, and the particles are finely and uniformly dispersed, and the elemental powder can be alloyed at room temperature. Among the mechanical alloying methods, the process is simple, the space occupied by the equipment is narrow, and the ball mill equipment capable of applying high energy is the most used. In this study, powder alloy is synthesized using the planetary ball mill and we thoroughly investigated the effect of ball milling time on the structural and magnetic properties of Fe-Si samples. The ball milling speed was fixed at 500 rpm and the ball milling time was changed from 10 hours to 40 hours. The structural properties and morphology of the samples and the size of particles were examined by X-ray diffraction (X'pert Pro MPD) and scanning electron microscopy (JSM-6510). Magnetic properties were measured using a vibrating sample magnetometer (VSM-7360). As milling time increases, the saturation magnetization is observed to increase. Since the coercivity depends on the movement of the magnetic domain in magnetization, the smaller the particle size in grain, the smaller the coercivity. Therefore, coercivity decreases due to grain size reduction.

Biography

Ji Eun Lee has a Bachelor's in Materials Science and Engineering Degree from Changwon National University. She is now pursuing a Master's Course from Changwon National University, School of Materials Science and Engineering. She is studying the synthesis of powders through a planetary ball mill, the effect of heavy metal waste water purification using iron oxide, and the development of high permeability materials for power inductors. She has been acquiring a lot of knowledge by participating in various conferences and presenting posters since last year.

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