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Magnetic and Structural Properties of Nitrified FINEMET Powder Prepared by Mechanical Method

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An $Fe_{73.5}Si_{13.5}B_9Nb_3Cu_1$ alloy, known as FINEMET, is an attractive soft magnetic material, which finds use in electric power applications such as transformer cores and other inductive devices. It exhibits excellent permeability (~ 10^5 at 1 kHz), a low saturation magnetostriction (~ 2×10^{-6}) and a relatively high saturation magnetization (~ 1.2 T).

The magnetic and structural properties of FINEMET [$Fe_{73.5}Si_{13.5}B_9Nb_3Cu_1$ wt %] amorphous powder were investigated after nitrification and mechanical milling. Fe-based amorphous powder were nitrified and crystallized simultaneously at 550℃ using by ammonia(NH_3) gas. Nitrified powder exhibited iron nitride phase such as γ′-Fe_4N, Fe_3N and α″-$Fe_{16}N_2$. Nitrified particles were more brittle than raw particles. As s result, nanometer sized nitride powder were fabricated by high energetic ball milling method. The saturation magnetization(Ms) and coercivity(Hc) of nitrified powder were increased due to nitride phase.

REFERENCES

[1] H. Chiriac, A.E. Moga, M. Urse and F. Necula Nanostructured Materials, **Vol. 12 Issues 1-4 (1999)** 495-498
[2] M. Manivel Raja, K. Chattopadhyay, B. Majumdar and A. Narayanasamy J. Alloys and Compounds. **Vol. 297 Issues 1-2 (2000)**199-205
[3] H.Okumura, D.E.Laughlin, and M.E.McHenry J.Magn.Magn.Mater. **267(2003)**347
[4] A. Kolano-Burian, J. Ferenc and T. Kulik Materials Science and Engineering A, **375-377 (2004)** 1078-1082

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Structure and Magnetic Properties of FINEMET Nano Powder Fabricated by Mechanical Milling Process

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An $Fe_{73.5}Si_{13.5}B_9Nb_3Cu_1$ alloy, known as FINEMET, is an attractive soft magnetic material, which finds use in electric power applications such as transformer cores and other inductive devices. It exhibits excellent permeability (~ 10^5 at 1 kHz), a low saturation magnetostriction (~ 2×10^{-6}) and a relatively high saturation magnetization (~ 1.2 T).

The magnetic and structural properties of FINEMET nano powder with a composition of $Fe_{73.5}Si_{13.5}B_9Nb_3Cu_1$ in wt% were investigated after annealing, chemical etching and mechanical milling. The primary and secondary crystallization temperatures and crystalline peaks are 523 °C and 550 °C, respectively. The grain size of particles was adjusted by annealing time. Optimally annealed particles exhibited a homogenous microstructure composed of nanometer-sized crystalline grains. The grain boundary of annealed particles was etched preferentially by chemical etching method. Chemically etched particles were broken at grain boundary by high-energetic ball milling method. As a result, nanometer-sized FINEMET powder with a same size of crystalline grains was fabricated

REFERENCES

[1] H. Chiriac, A.E. Moga, M. Urse and F. Necula Nanostructured Materials, **Vol. 12 Issues 1-4 (1999)** 495-498
[2] H.Okumura, D.E.Laughlin, and M.E.McHenry J.Magn.Magn.Mater. **267(2003)**347