

RD12

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

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An Fe<sub>73</sub>Si<sub>13.3</sub>B<sub>9</sub>Nb<sub>3</sub>Cu<sub>1</sub> 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 ( $\sim 10^3$  at 1 kHz), a low saturation magnetostriction ( $\sim 2 \times 10^{-4}$ ) and a relatively high saturation magnetization ( $\sim 1.2$  T).

The magnetic and structural properties of FINEMET [Fe<sub>73</sub>Si<sub>13.3</sub>B<sub>9</sub>Nb<sub>3</sub>Cu<sub>1</sub> wt %] amorphous powder were investigated after nitrification and mechanical milling. Fe-based amorphous powder were nitrified and crystallized simultaneously at 550 °C using by ammonia(NH<sub>3</sub>) gas. Nitrified powder exhibited iron nitride phase such as  $\gamma'$ -Fe<sub>4</sub>N, Fe<sub>3</sub>N and  $\alpha''$ -Fe<sub>16</sub>N<sub>5</sub>. Nitrified particles were more brittle than raw particles. As a 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.

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RD13

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

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The magnetic and structural properties of FINEMET nano powder with a composition of Fe<sub>73</sub>Si<sub>13.3</sub>B<sub>9</sub>Nb<sub>3</sub>Cu<sub>1</sub> 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

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