

Magnetic and Structural Properties of Nitrified FINEMET Powder Using by Mechanical Milling Method

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An Fe_{73.5}Si_{13.5}B₉Nb₃Cu₁ 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 ($\sim 10^5$ at 1 kHz), a low saturation magnetostriction ($\sim 2 \times 10^{-6}$) and a relatively high saturation magnetization (~ 1.2 T).

The magnetic and structural properties of FINEMET [Fe_{73.5}Si_{13.5}B₉Nb₃Cu₁ 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(NH₃) gas. Nitrified powder exhibited iron nitride phase such as γ' -Fe₄N, Fe₃N and α'' -Fe₁₆N₂. 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(M_s) and coercivity(H_c) of nitrified powder were increased due to nitride phase.