

Magnetic Properties of TiO₂-coated Fe-Cr-Si alloy powder

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Iron (Fe) metal powder have been used for inductor cores at high frequency since they exhibit soft magnetic properties of high saturation magnetization and low coercivity. However, a large core loss due to the eddy current induced by ac field has been one of the most serious problems at high frequency for real applications. To reduce the inter-particle eddy current loss, we tried to produce a core-shell structure composed of TiO₂ coated-Fe powder. The Fe powder in this study are composed of 8~9%Si, 2%Cr, Fe bal. The Fe-TiO₂ core-shell structure was synthesized by a sol-gel process using titanium-butoxide (TBOT) as a precursor of TiO₂. The coating parameters, such as the coating time and the concentration of TBOT, were controlled to achieve thin and uniform coating layer. The core loss could be greatly reduced by producing the Fe-TiO₂ core-shell structure. Detailed relationship between processing, microstructure, and magnetic properties of inductor cores using TiO₂-coated Fe powder will be presented for a discussion.

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