Magnetic Properties of Fe alloy – SiO_2 Core – Shell Structure

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Iron (Fe) metal powder shows soft magnetic properties such as high saturation magnetization and low coercivity. For that reason, it has been used for inductors of high frequency applications. However, because of its metallic property, eddy current is generated under AC field. The eddy current causes heat generation and critical failure at high frequency region. Considering inter-particle eddy current loss, coating Fe based powder with insulating materials has been researched to block the inter-particle current path. In this study, to reduce inter-particle eddy current loss under AC magnetization, core-shell structure consisting of Fe alloy powder and SiO_2 insulating coating layer was fabricated. SiO_2 coating was performed by sol-gel method using Tetraethyl orthosilicate (TEOS) as a precursor of SiO_2. The coating parameters, such as the coating time and the concentration of TEOS were controlled. Magnetic properties of SiO_2-coated Fe alloy powder, including permeability and Q factor, will be presented for a discussion.

Keywords : Fe powder, SiO_2 coating, insulating coating, eddy current loss