

Characterization and Fabrication of Fe metal powder Coated with Alumina oxide

SungJoon Choi^{*}, Sunwoo Lee, Jae-Hyoung Yoo and Sang-Im Yoo

Department of Materials Science and Engineering, and Research Institute of Advanced Materials,
Seoul National University, Seoul 151-744, Korea

In recent years, the soft magnetic composites (SMC) have attracted great interest as the potential applications in electromagnetic circuits, sensors, electromagnetic actuation devices, low frequency filters, induction field coils, magnetic seal systems, and magnetic field shielding. Among AC losses of metal powder, the eddy current loss could be reduced by an insulation coating to increase electrical resistivity. For the same purpose, we have tried to fabricate a core and shell layer composed of a Fe alloy metal powder and layer of Al_2O_3 by the sol-gel method. In this study, influences of the process conditions such as reaction time and concentration of Aluminium Isopropoxide (AIP) on the magnetic properties of the Fe alloy metal powder were investigated. To evaluate the AC losses of SMC, the magnetic core was fabricated by mixing and pressing Al_2O_3 -coated Fe alloy powder with a resin. The analysis of Fe alloy metal powder coated with Al_2O_3 was conducted using field emission-scanning electron microscope (FE-SEM), transmission electron microscope (TEM), Inductance analysis and B-H curve analyzer. The results showed that the Fe alloy metal powder was uniformly coated by a thin layer of Alumina oxide. Details will be presented for a discussion. This work was supported by a Grant from world class 300 (0417-20150129).

Keywords : Eddy current, Insulation coating, Core-shell structure