

Synthesis and characteristics of Al₂O₃-coated Fe alloy powder

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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 powder and layer of Al₂O₃ by the sol-gel method. In order to obtain a uniform coating of Al₂O₃ layer, we used sonication to avoid the agglomeration of Fe alloy powder before the coating process. In this study, influences of the process conditions such as reaction time and concentration of Aluminum isopropoxide (AIP) on the magnetic properties of the Fe alloy powder were investigated. Also the effect of the dieing pressure during the fabrication of core using Al₂O₃-coated Fe alloy powder was investigated. The analysis of Fe alloy metal powder coated with Al₂O₃ 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 powder was uniformly coated by a thin layer of Titanium oxide. Details will be presented for a discussion.

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