

Synthesis and Characterization of Coated Carbonyl Iron Powder

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Ferromagnetic particles coated with an electrically insulating layer are famous for soft magnetic composites (SMCs). Here we reported a new method to prepare SMCs using carbonyl iron powder, and further investigated their insulation coating performance. FTIR and XRD spectra were measured to confirm the coating components, and TEM-EDX analysis was utilized to check the thickness and uniformity of coating layer. Experiment shows that the particle surface contains a thin layer of phosphate salt with high coverage rate. With the coating layer increased, the electrical resistivity increased with less loss factor. Thermodynamic modeling of the chemical system has been adopted as a rational approach to establish routes to better synthesis conditions for pure phase magnetite. Parallel experiments of different metal elements involved in the forming of insulating layers have been done to determine optimum synthesis conditions. Size of insulating layer coated carbonyl iron powder have been controlled by silane coupling agent concentration and finally selected using test sieve with diameters between 63 μm and 106 μm . The quality of the inductive factors were enhanced due to eliminating the internal stress, thereby increasing the permeability.