## Magnetic Properties and Hysteresis Loss Improvement of Fe Alloy Powder by NH<sub>4</sub>OH Etching

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Fe based alloys can be represented one of excellent soft magnetic materials because of its high saturation magnetization with very low coercivity. For this reason, Fe based alloys and their composites have been used for core materials of electromagnetic applications such as inductors and converters operated under alternative current (AC). However, because the applications are used under AC, core loss generation is unavoidable and becomes more serious with increasing AC frequency. Since the operation frequency is required to increase for high performance of applications, core loss improvement strategies must be considered such as composition and microstructure control for hysteresis loss and insulation coating on powder for eddy current loss. In this work, etching with NH<sub>4</sub>OH solution of Fe based alloy powders were dispersed in NH<sub>4</sub>OH solution by ultrasonication. To optimize process parameters, pH, the concentration of NH<sub>4</sub>OH solution, and etching reaction time were controlled. Transmission electron microscopy (TEM), scanning electron microscopy (SEM) and energy-dispersive X-ray spectroscopy (EDS) were used for microstructure and composition analysis. Magnetic properties including permeability and core loss were measured under various AC frequency using toroidal powder core samples. Etched powder samples showed improved core loss values due to decreased hysteresis loss. Details will be presented for a discussion.

Keywords: core loss, hysteresis loss, Fe powder, surface etching, NH4OH etching