Thesis Title	Investigation of Magnetic Materials using the Barkhausen Effect
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Abstract

Barkhausen signal measurements were made on various laminated iron cores of transformers according to the Japanese Standards Association. The sample was inserted in the center of the secondary coil which was surrounded by the concentric primary coil. The primary was connected to the input AC triangle current source in order to produce an alternating magnetic field whereas the Barkhausen signal voltage, was induced in the secondary. The external factors that influence the Barkhausen signal voltage such as the changing rate of magnetic flux (by varying the frequency or the intensity of the magnetic field) and the sample sizes, were surveyed. It was found that the Barkhausen signal voltage increased as the magnetic flux increased with time. If the volume of the sample was constant, the Barkhausen signal voltage of a long sample (small demagnetization factor) was higher than that of a short sample (large demagnetization factor).

The average Barkhausen signal voltage was used to characterize the microstructure of the transformer core samples. A low frequency magnetic field of 0.035 Hz with the magnetic field rate of 133.7 A m^{-1} s^{-1} was applied to the sample size of 0.5 mm x 2 mm x 30 mm. Analysis of the pulse height distribution of the Barkhausen signal, revealed that the number of Barkhausen peaks decreased exponentially with increasing Barkhausen signal voltage.

The influence of various parameters on the domain wall motion, such as the hardness, stress and gain sizes, was also studied. The average Barkhausen signal voltage tended to increase with increasing hardness, stress and gain size. However, the analyze of the power loss of core materials revealed that the average Barkhausen signal voltage decreased with increasing the power loss. The results show that Barkhausen signal measurements may be a possible nondestructive technique for the evaluation of microstructure parameters of ferromagnetic materials.

Keywords : Barkhausen effect / Domain wall / Magnetic materials / Core loss