Profissonal development and communication skills in english

Linguistics, English

Technical Report Affiliated Technical Report Introduction Faraday’s law of magnetic induction s that the interaction of themagnetic field with an electric circuit produces an electromotive force (EMF). The phenomenon is defined as electromagnetic induction, which became the fundamental principle of operation of generators, solenoids and electric motors. The above-described concept is also used to establish Curie temperature of steel products. This report describes an experimental methodology for obtaining Curie temperature of various sheet metals.

Theory

Induction around a sample sheet metal is deduced using the formula, b = EMF / 4 f An (Tesla). In this formula; b is the peak induction, f is magnetsing frequency, A is the cross sectional area of the sample and n is the number of turns of the search coil around this sample. In order to evaluate the Curie temperature, a sample of the sheet metal is placed in an insulated temperature controlled furnace, which is then heated above its curie point. The sample is then let cool using a low frequency 10hz magnetic field. Curie temperature is established by measuring magnetic induction and induction-temperature.

Procedure

The experiment was conducted using the following materials: a furnace tube, a solenoid tube, a secondary tube, two identical search coils and a sample sheet. The arrangement of above materials is illustrated in Figure 1. The search coils were wound around a smaller tube, which was inserted inside another longer and larger tube in a way that the axes of both tubes aligned together. The solenoid was wound around the larger tube. The entire

construction was then inserted inside the furnace tube.

Figure 1. Experimental arrangement for deriving Curie temperature of metal

The furnace was heated approximately to 840 C; because of it, the solenoid and the search coil also got heated to the same temperature. The steel sample was then inserted into one of the two search coils as shown in the figure 1. After a period, the sample, solenoid and the furnace reached the same temperature. The furnace was switched off, and the solenoid was switched on once the entire system reached the temperature equilibrium. The sample was then allowed to cool unforced.

The experiment used 30 x 28 mm steel samples of various thickness; cross-sectional areas of the samples are shown in the attached table. The use of two identical search coils in series connection eliminated air flux induction, thus ensuring that the induced EMF was caused

Sample

Cross Sectional Areas (10^-6 m2)

C65218

42

H636

42

CR19081

84

H483

84

H603

112

Table1. Cross sectional areas of sample sheets

by the sample magnetisation alone from an uniform magnetic field produced by the solenoid. The solenoid used a sinusoidal time varying magnetic field; the strength of it was calculated with the help of an equation by inputting the values of the physical dimension of the solenoid and magnatising current value.

The measurement system of the experiment was computerized using an analogue to digital card (ADC), and a computer logged the data. Three voltage signals were measured for: solenoid current, sample temperature and induced EMF. The measured signals were passed to the ADC via electric circuit. The solenoid current circuit was based around an amplifier with a gain of 10. Measurement was made across a 0. 1 Ω power resistor connected in series with the solenoid magnetising current. A capacitor AC coupled with the 10Hz magetisation frequency provided DC block with input bias currents. The measurement accuracy was +/- 5%. The sample temperature was measured with a K type industrial thermocouple; the junction temperate was converted to a 1mV/C output by a commercial thermocouple to analogue converter. This was a DC voltage measurement process using an amplifier with a gain of 10. The measurement accuracy was +/- 6oC. The induced EMF circuit used a low pass filter on the output of an amplifier with a gain of 1000. The accuracy of signals was in the order of 0-4mV +/- 5μV. A software was controlling the entire system, recording 1000 discrete readings of each measurement, calculating the RMS value of the solenoid current, the average value of the sample temperature, and induced EMF values. The

results were written in the data file at every 8 seconds (Jiles, 1998).

References

Jiles, D. (1998). Introduction to magnetism and magnetic materials.

Chapman &Hall. ISBN 0-412-798603