

MICROCALORIMETRIC MEASUREMENTS OF WEAK MAGNETIC
LOSSES IN MANGANESE ZINC FERRITE

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The microcalorimeters of the Tian-Calvet type [1] are used for measuring weak heat effects in physico-chemical and biological processes. The differential microcalorimeter of the above type but of original realization [2,3,4] is used by the authors in the investigation of ferrites [4].

In short, microcalorimeter consists of two parts: in one of them the investigated heat effect is produced, and in the other the compensational heat effect (heating by Joule effect). The chambers of each part are 4 cm^2 in volume. Each of the chambers has a battery of 40 thermocouples copper-constantan. A signal obtained by two

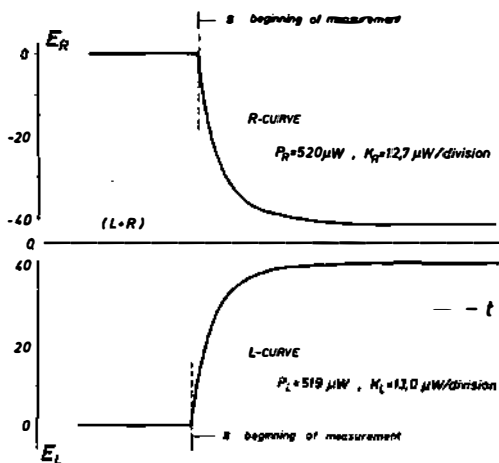


Fig. 1.

differentially connected batteries of thermocouples is brought to the recorder (Model BD-5, Kipp and Zonen). At the measuring range of $20 \mu\text{V}$ the sensitivity of the device is of the order of $1 \mu\text{W}$. The time constant of the device is about 6 minutes.

As an illustration of the above mentioned, in Fig.1 the calibration curves for one measuring range of the microcalorimeter are shown. The curve corresponding to the signals from one and that from the other chamber, as well as the curve corresponding to the differential signal are recorded on the same part of the moving tape. The curve L in Fig.1. shows the deflection of the recorder proportional to the EMF of the thermocouple battery after the production of heat effect in the left chamber ($P_L = 520 \mu\text{W}$). Gradual establishment of stationary regime in the calorimeter can be observed. The curve R shows the deflection of the recorder after the heat effect is produced in the right chamber ($P_R = 519 \mu\text{W}$). The device has weak asymmetry: the "power constants" K differ for 2%. During the simultaneous production of the heat effects P_L and P_R the recorder remains in zero position (the straight line L + R).

Similar procedure lies in the basis of measuring with this device: the heat effect that corresponds to the losses during remagnetization is compared with the power that corresponds to the controlled Joule effect. The authors used this procedure for absolute measurement of losses during remagnetization of Mn-Zn ferrite. The sample was of toroidal form, and 0.2 g in weight. Such small samples enable very sure determination of true temperature and of homogeneity of the conditions in general. The investigations were performed for weak magnetic fields at $H < 0.5 \text{ Oe}$; there are in literature no data on the measurements in so weak fields. In Fig. 2 is shown the depen-

dence of the losses during remagnetization (P) on the field magnitude for frequency 15 kHz. On the basis of

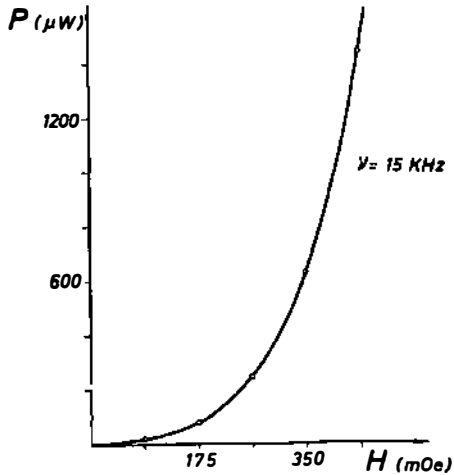


Fig. 2.

such data it is possible to make conclusions as concerns the mechanism of remagnetization of magnets in weak fields.

References:

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