Field Dependence of Magnetoresistivity and Hall Coefficient for Carbons at Various Temperatures*

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Using the experimental arrangement developed by Inagaki, Komatsu and Zanchetta[1] for studies of galvanomagnetic properties of carbons in the temperature range 1.5° - 300°K, the magnetic field dependence of the magnetoresistivity and of the Hall constant was investigated at various temperatures for soft and hard carbons heat treated in the range from 1000°C to 3000°C. Some of the materials doped with acceptors were also studied. For high heat treatments and at intermediate magnetic field, results are in agreement with the findings of Mrozowski and Chaberski[2] and Chaberski[3]. At higher magnetic field (10,000 - 23,000 Oe) however, the exponent of the field dependence decreases considerably for higher heat-treatment temperature. This decrease is greater at lower temperatures. Some field dependence of Hall constant was found for soft carbons of HTT 2200-3000°C. However for the heat treatment range where the magnetoresistivity about changes from negative to positive, that is HTT 2000 - 2600°C, strong deviations from the power dependence were found for the soft carbon, in some ways similar to the effect found by Takeya et al[4] in pyrolytic graphite. While in Takeya's work an oscillating behavior is indicated, for our samples a negative magnetoresistance at low fields changes into positive at higher fields and continues to increase without any indication of a turnaround back to negative. No case of positive turning into negative with increase of the field has been observed. Since our samples are disordered polycrystalline materials it is hard to see how Takeya's explanation could be applicable. It rather seems that there are two independent mechanisms, one causing the positive and the other the negative magnetoresistance, the contribution of the positive increasing with increase in heat-treatment temperature and with the strength of the magnetic field. A few typical curves obtained are shown in four graphs. More graphs will be presented at the Conference.

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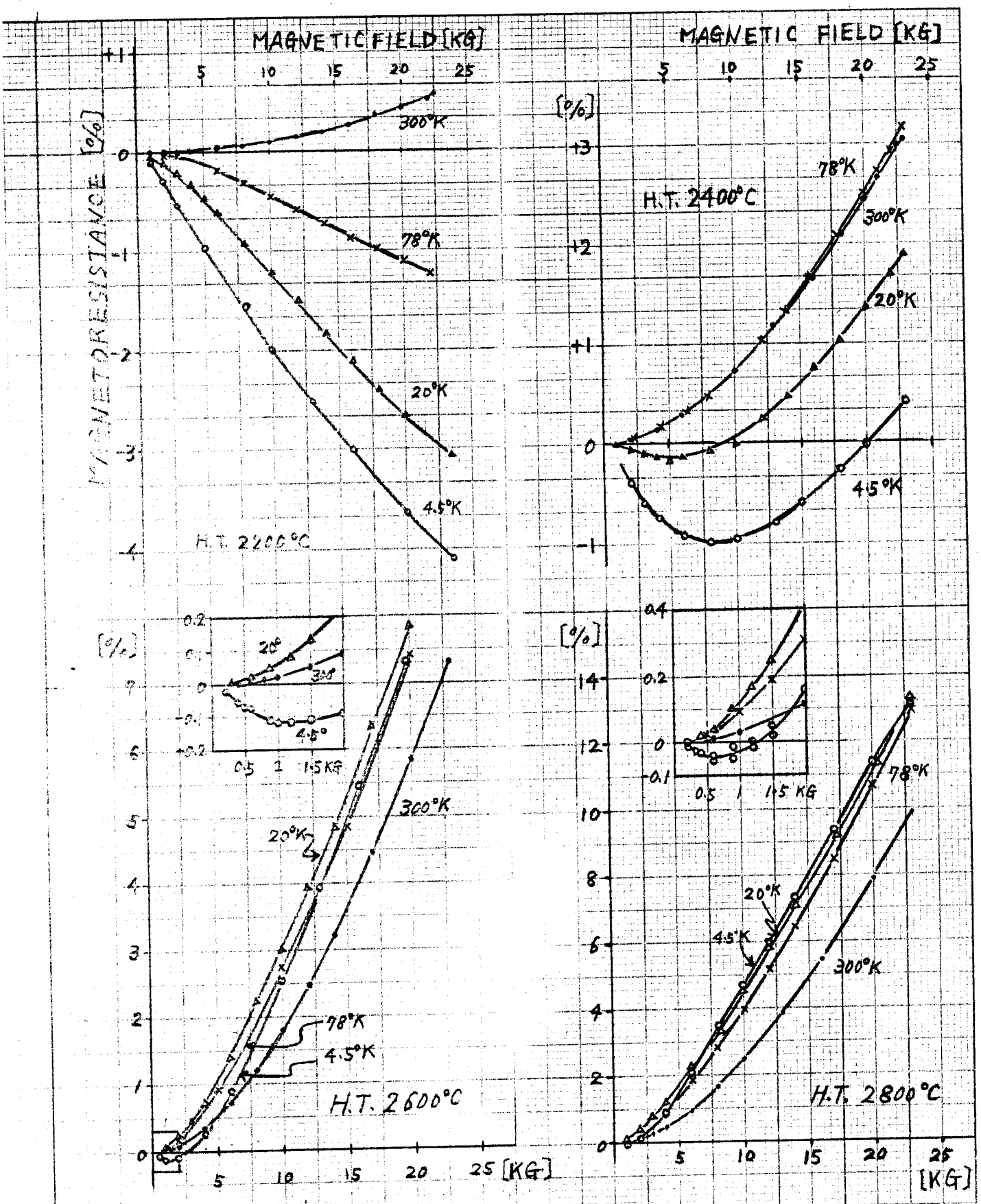
1. Previous paper at this Conference
2. S. Mrozowski and A. Chaberski, Phys. Rev. 104, 74 (1956)
3. A. Chaberski, Ph.D. Thesis, State University of New York at Buffalo (1965)
4. K. Takeya, K. Yazawa, N. Okuyama and H. Akutsu, Phys. Rev. Letters 15, L529 (1965)



Dependence of magnetoresistance of Soft Carbon on magnetic field