Magnetic Transitions in Alpha Hematite

Recently Smith and Fuller (*1*) discussed the stable magnetic remanence and memory behavior in alpha hematite (α-Fe_2O_3); they suggested from experimental evidence that the magnetization of α-Fe_2O_3 consists of a soft spin-canted moment and a hard defect moment. They noted that the former is observed between $-20°$ and 675°C, while the latter is maintained up to the Néel point of α-Fe_2O_3 at 725°C. Their conclusions appear to be based primarily upon the differential thermal analysis (DTA) work by Aharoni, Frei, and Schieber (*2*) who stated that the true Néel point of stoichiometric α-hematite is 725°C, approximately 50°C above the Curie point. Smith and Fuller have drawn upon certain magnetometer work (*3*) and other work (*4*) showing that apparently the absolute temperatures of these transitions depend on the impurity (especially Ti) content.

Our purpose is to point out that several investigations by various experimental techniques have shown that there exists only one transition of an order-disorder of second order in the region of 700°C. The DTA work by Lielmezs and Chaklader (*5*; single antiferromagnetic Curie point at 690° ± 5°C) and Schneider and Beaulieu (*6*; Curie and Néel points coincide at 685° ± 5°C), and dilatometric measurements (*7*) showed that there is only one phase transition—at 687° ± 10°C.

It is of interest to note that independent Mössbauer-effect studies (*8*, *9*) of α-Fe_2O_3 also reveal no difference between the Curie and Néel points. Moreover, our most recent DTA experiments (Fig. 1) on spectrographically pure α-Fe_2O_3 (*10*) show that there is only one phase transition, at 683° ± 2°C, which is also the Néel or the antiferromagnetic Curie point of α-Fe_2O_3, contrary to suggestions (*2*). Further experiments with standardized and precise thermocouples showed that the temperature of this order-disorder change is very close to 683°C. This observed temperature of the Néel point is the same as that (956°K) suggested by van der Woude (*8*) in his work on the Mössbauer effect in α-Fe_2O_3.

Regarding the comment (*1*), based on the work of Aharoni *et al.* (*2*), that the Néel temperature (as separated from the Curie point) for the stoichiometric α-Fe_2O_3 is 725°C, and that therefore one can explain the stable fraction of remanence, we feel that these statements are not substantiated by experimental observations. However, further study may clarify the effect of impurities such as Ti on the Néel and Curie points of α-Fe_2O_3.

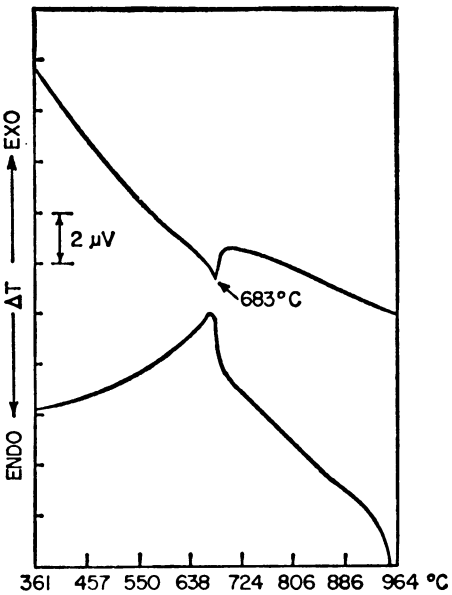

Fig. 1. Differential thermal analysis of α-Fe_2O_3 in air; heating rate, 10°C per minute.

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References and Notes

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Hypothalamic Releasing Factors: Distribution of Samples

It is usually difficult for qualified investigators to obtain milligram quantities of peptide hormones such as alpha- and beta-melanocyte-stimulating hormone (MSH), or even oxytocin and vasopressin, in spite of the fact that these peptide hormones can be purified from natural sources and made synthetically. Being an endocrinologist who is not averse to doing purification work, I have had the pleasure and privilege of supplying these peptide hormones, sometimes in sizable quantities, to colleagues near and far. The samples have been used wisely, as the literature attests. The purpose of my comment, however, is to relate my less happy experiences with requests for samples of the elusive and rare hypothalamic neurohumors controlling the secretion of anterior pituitary glands. The hypothalamic releasing factors have blossomed during the past few years into a family of seven well-established neurohumors (*1*) as well as a few of doubtful status. But even before they became accepted entities, the demand for them from researchers in many countries was considerable, prompted mainly (I want to think) by a desire to verify, for their own satisfaction, that these neurohumors really existed.

There are only nanogram amounts of these hormones in each hypothalamus. After securing tens or hundreds of thousands of hypothalami at no small monetary cost, and laboring over them for months, one emerges, if successful, with a few hundred micrograms of active material. This amount is hardly adequate for the determination of the chemical structure which, of course, must receive top priority. To receive two requests within a few hours for 25 to 50 mg of the "pure" factor, as I once did, sets one back a pace or two.

I once supplied a well-known investigator with 1 mg of a highly purified factor, corticotropin releasing factor (CRF), after taking care to emphasize to him that it was very unstable, as some of these hypothalamic factors are, and that it should be stored in a vacuum at −60°C. (Fortunately the storage requirements of other releasing factors are not nearly so exacting.) Some months later I was puzzled on hearing that the material was inactive. The mystery was solved when I discovered he had stored the sample in a desk

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