LETTERS TO THE EDITORS

Single Crystal of Fe_2O_3 Formed by Thermal Decomposition of Ferric Nitrate.

K. IWASE, K. OGAWA and T. TAKADA

Kyoto Univ.

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The crystal of ferric nitrate, $\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$, dissolves in its water of hydration when it is heated at about 100° and separates out its anhydrate or the like on further heating to evaporation. The salt thus separated was then heated in an electric furnace, kept at 500° , for two hours and a reddish powder was obtained as the result of decomposition. X-ray analysis has proved that this powder consists of crystals of ordinary ferric oxide. The reddish powder thus obtained was then taken as samples for electron microscopic examination after the usual preparation. The powder was dispersed in distilled water using super-sonic waves. It was observed under the electron microscope that the particle size of the individual grains ranges from 0.02μ to 0.04μ and that some particles are irregularly flocked together while some look as if they are regularly oriented. Photo. 1 shows a group of such regularly oriented particles the diffraction pattern of which is shown in Photo. 2.

Photo. 1 x20000

Photo. 2

An analysis of the pattern informs us that the whole mass of the ferric oxide shown enclos- edly in Photo. 1 consists of a single crystal and that the electron beam was cast on

the crystal in the direction perpendicular to the basal plane of the hexagonal crystal. From the result above obtained, the crystal shown in Photo. 1 is thought to be a single crystal, well developed in the direction perpendicular to the plane $(10\bar{1}0)$ of the hexagonal crystal and less

in the direction $[0001]$, thus forming a sheet crystal. The arrow $\rightarrow$ represents the direction perpendicular to $(10\bar{1}0)$. Similar thin plate crystals are often obtained in natural and artificial hematites. Hence the porous structure and the unequal thickness of the mass shown in Photo. 1 may be attributed not to the at random distribution or gathering of the individual particles but to some conditions of thermal decomposition. Therefore it may be concluded that the individual particles of ferric oxide formed by thermal decomposition of ferric nitrate arrange themselves so as to form a single crystal of hematite during the course of decomposition when circumstances are favorable. It will be remarked here that the group of particles in Photo. 1 could not be dispersed to individual particles having the dimension of $0.02\sim 0.04\mu$ even when it was treated with 0.003 mol/L solution of sodium pyrophosphate. Similar single crystals were often obtained in the present writers' laboratory when oxides were reduced to metals and sulphates or oxalates were thermally decomposed to oxides, about which a full account will be published elsewhere. The electron microscope used in the present work was marked as SM-U-6 by its maker, the Shimazu Seisakusho, Kyoto, and the present writers wish to express their hearty thanks to Mr. Shinichi Shimazu, Dr. Sci., and Mr. Masaru Matsuo who kindly aided the present work.