NOTES AND NEWS

MAGHEMITE OR OXYMAGNITE?

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The existence of highly magnetic ferric oxide has been known for more than eighty years, but its relation to other iron oxides is still not fully determined. It was noticed by Plücker[1] in 1848 and by Robbins[2] in 1859; it has been discussed repeatedly; recent studies include those of Welo and Baudisch,[3] Sosman and Posnjak,[4] Gruner,[5] Twenhofel,[6] Osborne[7] and others. Sosman and Hostetter[8] present evidence tending to show a (nearly?) complete series of "solid solutions" from hematite to magnetite. It seems probable that this series of "solid solutions" is to be explained as various stages in the gradual process of oxidation of magnetite, although the reverse process—that is, the gradual reduction of hematite—may be important also.

Most of the studies of these oxides of iron, upon both natural and artificial products, lead only to indefinite conclusions because they were not accompanied by X-ray studies, and therefore it is difficult or impossible to determine whether the samples examined consisted of pure magnetite or pure hematite or one of these two with submicroscopic inclusions of the other. On the other hand both Gruner and Twenhofel prove conclusively that pure artificial magnetite may be oxidized to the composition of hematite without losing the magnetite space-lattice and with no admixture of the hematite space-lattice. Wagner[9] states that "oxidized magnetite" or "ferromagnetic ferric oxide" is abundant in the upper part of the norite zone of the Bushveld igneous complex; he made no X-ray study of the material, but had the benefit of a microscopic examination of it by Schneiderhöhn. Since the substance is found in nature it should have a simple mineral name; he considers "ferromagnetic ferric oxide" too long and says that "oxydized magnetite" is "misleading, as it [the substance] contains no ferrous oxide"; therefore he suggests that it should be called "maghemite."

The writer agrees fully with Wagner that "ferromagnetic ferric oxide" is unsatisfactory as a mineral name, but he considers "oxydized magnetite" as strictly accurate, since it does not imply the necessary presence of ferrous oxide nor require the entire absence of ferrous oxide; the artificial (and probably the natural) substance may contain some ferrous oxide, but in the case of complete oxidation (rather easily accomplished) contains none. However, "oxydized magnetite" is too long to be satisfactory as a mineral name and the writer would suggest that it might be abbreviated to *oxymagnite.*

Wagner's name seems undesirable since it suggests that the substance is intermediate between magnetite and hematite or else is hematite which has becor‹

[1] *Pogg. Ann.*, **LXXIV,** 1848, p. 321.
[2] *Chem. News*, **I,** 1859, p. 11.
[3] *Phil. Mag.*, **L,** 1925, p. 399.
[4] *Jour. Wash. Acad. Sci.*, **XV,** 1925, p. 329.
[5] *Econ. Geol.*, **XXI,** 1926, p. 375.
[6] *Econ. Geol.*, **XXII,** 1927, p. 180.
[7] *Econ. Geol.*, **XXIII,** 1928, pp. 724–761, 895–922.
[8] *Jour. Amer. Chem. Soc.*, **XXXVIII,** 1916, p 807
[9] *Econ. Geol.*, **XXII,** 1927, p. 845.

magnetic. If hematite can be deoxidized to the composition of magnetite while retaining its own space-lattice (as seems probable) and, if this process causes it to become highly magnetic, then material of that kind might well be called maghemite. Of course, such a substance might resemble oxidized magnetite in its appearance, but it would necessarily be different in external form, in the symmetry of its internal structure and in its optical properties.

Walker[10] has recently suggested that the name maghemite should be applied to an iron-rich member of the series which he writes as follows:

Titanic sesquioxide
Ilmenite
Maghemite
Ferromagnetic ferric oxide

It is unfortunate that, as yet, there is no evidence of an X-ray examination to determine the chief space-lattice of the material studied by Walker. Chemical analysis and microscopic study seem to indicate that it is actually a titaniferous maghemite as that term is understood by the writer. It seems probable, therefore, that the answer to the question: "Maghemite or oxymagnite?" is: "Both."

BOOK REVIEWS

UNIVERSAL DREHTISCHMETHODEN, M. Reinhard. 119 pages, 49 figures. B. Wepf and Cie, *Basel*, **1931**. Price $2.40 bound.

The purpose of this book is to present an outline of the theory of crystal optics for the beginning student and to apply these principles to the study of universal stage methods. The stage used is the Leitz model and the nomenclature is European. The recommended procedure is also European, consisting of orienting an unknown, and plotting all known critical data on a stereographic projection. For accuracy Professor Reinhard recommends the use of standard accessories commonly employed in careful work of this sort.

There is evident throughout the text the necessity at times of minute detail and a willingness to carry out lengthy graphical constructions to obtain the desired goad Although in America the possibilities of the Universal stage is generally admitted its comparative lack of use seems to be attributable to an unwillingness to execute these details of graphical constructions. Professor Reinhard's book is a splenditr exposition of the advantages to be gained by careful and detailed work of the sods described.

The last half of the book is devoted to a discussion of the universal stage methol., as applied to plagioclase determinations. The methods consist of making stereographic projections of the optical elements of the unknown plagioclase with relation to a known crystallographic direction and comparing this projection with plates provided in the book. On the plates there are curves—"Migrationskurven"—showing the possible positions of optical symmetry elements according to the composition of the plagioclase. There should be a reasonable agreement between the projection of the unknown and related points on the curves of the plate. The points of the unknown indicate by their positions on the "Migrationskurven" the composition of the plagioclase. The curves have already been published in similar form in the earlier book by L. Duparc and M. Reinhard—"La détermination des plagioclases dans les coupes minces." They are also reproduced in A. N. Winchell's Part II, Optical Mineralogy.

[10] *Univ. Toronto Stud. Geol. Ser.* No. **29,** 1930, p. 17.