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W. D'Hisinger & J.B. Berzelius

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air, these were set into better motion, and the stagnated fluids absorbed, and more *vis vitæ* thrown on the surface, sufficient to remove cutaneous obstructions; and, aided by tonic medicines, the disease vanished.

5. *Query*—Would the *vital air* alone have effected so extraordinary a cure? or *medicines*?—It is from *combined powers* that I believe the benefit arose, as I have before endeavoured to explain in some other cases.

I have the honour to remain,

Dear sir,

Your faithful, obliged friend,

ROBERT JOHN THORNTON.

XXVI. *On Cerium, a new Metal found in a Mineral Substance of Bastnas in Sweden, called Tungsten, described by W. D'HISINGER and J. B. BERZELIUS*.*

I. *Description of the Tungsten of Bastnas.*

THOUGH this substance was formerly tried by Scheele and D'Ellhuyar, under the name of wolfram, yet its considerable specific gravity determined us to subject it to further researches. Our object in particular was to find yttria, which, being unknown at the time when these chemists carried on their labours, might have escaped their attention. Our suspicions were ill-founded; since, instead of an earth, we found in it, according to every appearance, a substance hitherto unknown, as will be seen by what follows:

The tungsten of Bastnas, which we call cerite, for reasons which will be hereafter mentioned, was found in the year 1750, in a copper mine called Bastnas, or Saint Gorans Koppargrufva, at Riddare-Hyttan, in Westmannia, of which it formed with asbestos the matrix; but after that time it was inclosed in quartz and mica, at the depth of seventeen toises.

Tungsten is almost always mechanically mixed with black amphibolite (hornblend), striated actinote, of a bright green colour (schorl), with mica, sulphurated copper, bismuth, and sulphurated molybdena, as one may be more readily convinced by exposing it to the fire.

Cerite, properly so called, is transparent, of a flesh colour, sometimes dark, sometimes bright, and rarely yellow. The stone in a mass, and in small specimens, is of an irregular

* From *Annales de Chimie*, No. 150.

form;

form; its fracture is indeterminate, compact, and somewhat brilliant; the edges obtuse; its consistence is tenacious and strong; it strikes fire with difficulty, but it does not scratch glass; it is not susceptible of attraction by the magnet; but when it has been brought to a red heat in the fire, it loses its hardness and six or seven per cent. of its weight. By this operation it becomes friable, and assumes a bright yellow colour; it does not fuse alone.

Cronstedt, in his Mineralogy, places it, in consequence of its specific gravity, among the tungstens. In pure fragments its weight is to that of water, as 4733 and 4935 to 1000. As Scheele did not find wolfram in it, he called it false tungsten.

According to an analysis of D'Ellhuyar, the constituent principles of this mineral were given by Bergmann, in the Memoirs of the Academy for the year 1784, p. 121, as follows:

Silex	-	022
Iron	-	024
Lime	-	054

100

Heated by the blow-pipe with borax, it forms a glass globe, which, when warm, appears greenish, but colourless when it has cooled. When fused with carbonate of soda, in a platina spoon, it is not dissolved.

II. Analysis of Cerium.

To separate the yttria, which it was suspected to contain, it was reduced to a fine powder in a porphyry mortar, and pure concentrated nitric acid was then added to it. The acid was decomposed, and a considerable quantity of nitrous and carbonic acid gases was disengaged. The stony powder was several times treated with acid, until the insoluble residuum appeared white.

The solution, diluted with water, had a yellow colour, which became greenish by ebullition, and then red;—when dried completely, it became yellowish white; but by attracting humidity it resumes its red colour.

In alcohol it is entirely dissolved, and the solution, when slightly digested, deposits a considerable quantity of oxide of iron. It deposited also more oxide of iron during a rest of some days in a window. The solution decanted, being almost clear, was evaporated to dryness, and the salt calcined exhibited a powder of a brick colour. Water was able

able to dissolve only the calcareous earth. Distilled vinegar became charged only with a very small portion, and was not saturated, though assisted by the heat of ebullition. The acetic solution, when evaporated, gave small granulated crystals, of a saccharine and astringent taste. They were not soluble in alcohol. The part of the acetous salt, which was not dissolved by alcohol, gave, after calcination, a powder of a brick colour, similar to that which had not been dissolved.

Ammonia precipitated from the solution of the alcohol a white powder, which became yellowish in the air. It was a little soluble by carbonate of ammonia, and, by calcination, assumed a brick colour. The sediment being separated, the carbonate of ammonia produced a white precipitate, which was pure carbonate of lime. The acetous salt then contained no yttria. The powder from which the calcareous earth had been separated, dissolved in muriatic acid, disengaging oxygenated muriatic acid gas, which indicated that it was a metallic oxide.

Was it oxide of manganese united with oxide of iron?

To ascertain this, we tried to develop the pure oxide from the manganese by means of the tartrate of potash, according to the method of Richter. In this manner we decomposed with tartrate of potash a solution of this substance in muriatic acid perfectly neutralized, and, after having well washed the white precipitate, we subjected it to slow calcination: but this produced only powder of a brick colour.

Caustic alkali had no action on the insoluble part of the nitrate; which proves that it contained no alumine.

To obtain the metal pure in a sufficient quantity for making several trials, we dissolved another portion of cerite in nitric acid, and evaporated the solution to dryness: Water was then poured over the residuum, and the whole was precipitated by ammonia. The precipitate when washed was dissolved in nitric acid. The solution, when well neutralized by alkali, was precipitated by the tartrate of potash. There was precipitated also from the same solution, by carbonate of potash, a white powder, but in small quantity. Both these precipitates were calcined separately, and both assumed a brick colour. The precipitate formed by the carbonate of potash was not dissolved by the potash with the assistance of digestion; there was therefore no alumine in it. The iron which the solution precipitated by the tartrate of potash contained, was separated by the hydro-sulphuret of ammonia. The rest of the solution of
the

the cerite in nitric acid, which had been precipitated by caustic ammonia, gave by carbonate of ammonia carbonate of lime.

It results from these trials that cerite contains nearly 23 parts of silice, 5.5 of carbonate of lime, 22 oxide of iron, and a quantity of that matter in a metallic state; the weight of which after calcination exceeded, a little, 50 per cent. But this substance being then, as well as the iron, united with more oxygen than they contained in the cerite, instead of loss we had an increase of gravity, which in all probability arose from the oxygen. The loss which the cerite had experienced by calcination is not here included. We thus found traces of manganese, but in a quantity so inconsiderable that the potash fused with cerite and dissolved in water exhibited no colour.

Not having much experience in regard to complete analysis, as far as quantity is concerned, we give these results only with reserve, and in the hope that more expert chemists will employ themselves on this object.

III. *Examination of the metallic Oxide found in Cerite.*

With 37 grains of this oxide and linseed oil we made a paste, which was reduced to charcoal in a covered crucible. It lost half a grain of its weight. This mass was inclosed in a crucible of charcoal without flux: and M. Hjelm exposed it for half an hour to such a degree of heat as would be necessary for the reduction of manganese. The oxide was not fused, but reduced to a very fine powder: it exhibited to the light brilliant particles, and stained white paper black. It dissolved in muriatic acid, disengaging at the commencement sulphurated hydrogen gas, and then pure hydrogen gas. This colourless solution had a saccharine taste. It therefore appeared to us that the metal was in part reduced. One may find the origin of the sulphur in the sulphuric acid from which the matter had been separated by caustic ammonia. It will be seen by further researches what influence this acid has in these trials.

M. Gahn, of Fahlun, having a proper apparatus, promised to us to undertake the reduction of this substance with more force. If this operation be attended with success, we shall give an account of it hereafter.

These and the following circumstances have determined us to consider the substance found in cerite as the oxide of a metal hitherto unknown, to which we have given the name of *cerium*, from the planet Ceres discovered by Piazzi.

Method

Method of obtaining Oxide of Cerium.

(A.) Dissolve pure cerite, not calcined, in nitro-muriatic acid, and, having saturated the clear solution with alkali, precipitate it by tartrate of potash. The precipitate, when well washed, calcined, and digested in vinegar, contains pure oxide of cerium.

Or decompose a solution of cerium in nitro-muriatic acid, still warm, but not saturated by succinate of ammonia: a succinate of iron is gradually deposited. Continue this precipitation by muriate of ammonia until a white precipitate appears. Leave the solution at rest, in order that the small portion of succinate of cerium may be deposited. The iron dissolved by the free muriatic acid deposits itself at the same time, and the solution is obtained free from that metal. You may then precipitate the cerium with ammonia, and wash and calcine it.

Of the Properties of Oxide of Cerium.

(B.) This oxide may appear under different degrees of oxidation. Alkalies precipitate from its solutions a white oxide, which in the air has a yellowish colour, but which when perfectly dry becomes dark. When exposed to a strong heat, long continued, it assumes a dark brick colour. The oxalate and acetate of cerium, when calcined in vessels not completely shut, give a white oxide, which on an open fire becomes of a brick colour. It does not fuse alone.

Treated by the blowpipe with borax, it readily fuses and swells up. The globule struck, by the external flame, assumes a blood colour, which by cooling passes to a greenish yellow, and at length becomes colourless and acquires complete transparency. Fused by the interior flame, these changes do not take place: it is then reduced to colourless glass, but when exposed a little time to the exterior flame the same phenomena are exhibited. If too much oxide of cerium be employed, the glass resembles yellowish opaque enamel. These changes are manifested more readily with phosphates of soda and of ammonia. If two clear colourless globules, one of which is made with borax and the other with phosphate, be fused together, they give a transparent glass, which on cooling becomes of an opaque pearl colour.

These characters taken together distinguish oxide of cerium from oxide of iron. The latter presents the same changes of colours; but its glass, after it has been cooled, has a dark green fugitive colour.

The globules of borax and phosphate fused together give an opaque glass, the colour of which is a little darker.

[To be continued.]