CHEMISTRY

Some Elements of Group V

"A Classic Of Science"

Columbium Came From America, Tantalum and Vanadium From That Storehouse of Rare Elements, Scandinavia

Columbium

AN ANALYSIS OF A MINERAL SUBSTANCE FROM NORTH AMERICA, Containing a Metal Hitherto Unknown. By Charles Hatchett. Published in Philosophical Transactions of the Royal Society of London, MDCCCII (1802). *Read November* 26, 1801.

IN THE COURSE of the last summer, when I was examining and arranging some minerals in the British Museum, I observed a small specimen of a dark-coloured heavy substance, which attracted my attention, on account of some resemblance which it had with the Siberian chromate of iron, on which at that time I was making experiments.

Upon referring to Sir Hans Sloane's catalogue, I found that this specimen was only described as "a very heavy black stone, with golden streaks," which proved to be yellow mica; and it appeared, that it had been sent, with various specimens of iron ores, to Sir Hans Sloane, by Mr. Winthrop, of Massachusetts. The name of the mine, or place where it was found, is also noted in the catalogue; the writing however is scarcely legible: it appears to be an Indian name, (Nautneauge;) but I am informed by several American gentlemen, that many of the Indian names (by which certain small districts, hills, &c. were forty or fifty years ago distinguished,) are now totally forgotten, and European names have been adopted in the room of them. This may have been the case in the present instance; but, as the other specimens sent by Mr. Winthrop were from the mines of Massachusetts, there is every reason to believe that the mineral substance in question came from one of them, although it may not now be easy to identify the particular mine.

Description of the Ore

The external colour is dark brownish gray.

The internal colour is the same, inclining to iron gray.

The longitudinal fracture is imperfectly lamellated; and the cross fracture shows a fine grain.

The lustre is vitreous, slightly inclining in some parts to metallic lustre.

It is moderately hard, and is very brittle.

The colour of the streak or powder is dark chocolate brown.

The particles are not attracted by the magnet.

The specific gravity, at temp. 65°, is 5918. . . .

Remarks

The preceding experiments shew, that the ore which has been analysed, consists of iron combined with an unknown substance, and that the latter constitutes more than three-fourths of the whole. This substance is proved to be of a metallic nature, by the coloured precipitates which it forms with prussiate of potash, and with tincture of galls; by the effects which zinc produces, when immersed in the acid solutions; and by the colour which it communicates to phosphate of ammonia, or rather to concrete phosphoric acid, when melted with it.

Moreover, from the experiments made with the blow-pipe, it seems to be one of those metallic substances which retain oxygen with great obstinacy, and are therefore of difficult reduction.

It is an acidifiable metal; for the oxide reddens litmus paper, expels carbonic acid, and forms combinations with the fixed alkalis. But it is very different from the acidifiable metals which have of late been discovered; for,

1. It remains white when digested with nitric acid.

2. It is soluble in the sulphuric and muriatic acids, and forms colourless solutions, from which it may be precipitated, in the state of a white flocculent oxide, by zinc, by the fixed alkalis, and by ammonia. Water also precipitates it from the sulphuric solution, in the state of a sulphate.

3. Prussiate of potash produces a copious and beautiful olive-green precipitate.

4. Tincture of galls forms orange or deep yellow precipitates.

5. Unlike the other metallic acids, it refuses to unite with ammonia.

6. When mixed and distilled with sulphur, it does not combine with it so as to form a metallic sulphuret.

7. It does not tinge any of the fluxes, except phosphoric acid, with which, even in the humid way, it appears to have a very great affinity.

8. When combined with potash and dissolved in water, it forms precipitates, upon being added to solutions of tungstate of potash, molybdate of potash, cobaltate of ammonia, and the alkaline solution of iron.

These properties completely distinguish it from the other acidifiable metals, *viz.* arsenic, tungsten, molybdena, and chromium; as to the other metals lately discovered, such as uranium, titanium, and tellurium, they are still farther removed from it. . .

I am much inclined to believe, that the time is perhaps not very distant, when some of the newly-discovered metals, and other substances, which are now considered as simple, primitive, and distinct bodies, will be found to be compounds. Yet I only entertain and state this opinion as a probability; for, until an advanced state of chemical knowledge shall enable us to compose, or at least to decompose, these bodies, each must be classed and denominated as a substance *sui generis*. Considering, therefore, that the metal which has been examined is so very different from those hitherto discovered, it appeared proper that it should be distinguished by a pe-

culiar name; and, having consulted with several of the eminent and ingenious chemists of this country, I have been induced to give it the name of Columbium.

Tantalum

EXTRACT FROM A MEMOIR on the Properties of Yttria Earth Compared with those of Glucine; on the Fossils in which the Former of these Earths is Contained; and on the Discovery of a new Substance of a Metallic Nature. By A. G. Ekeberg. Published in The Philosophical Magazine, Vol XIV. London (1802).

THE FIRST PART of this memoir contains an account of some experiments, made by M. Eckeberg, to establish the difference between glucine and the earth discovered in the gadolinite, and called yttria or gadoline; but as the peculiar nature of each of these earths is already well known to chemists, it is here needless to repeat what has been already said on that subject.

As the other is interesting on account of its novelty, we shall lay before our readers the observations made on it by the author.

Though the mineral substance I discovered, says he, contains yttria, it could not be classed in a system of mineralogy as a species of earth, on account of the more abundant mixture it contains of another substance equally remarkable, and which must increase the class of metals, already very numerous. I found this substance in two fossils, obtained from different places; in one of them, it was united with iron and manganese; and in the other, with the former of these metals and gadoline.

This new metallic substance is distinguished by its insolubility in all acids. The only re-agent which has any action on it is caustic fixed alkali. When subjected to heat with this alkali, if the mass be then lixiviated, it partly dissolves in the water, and suffers itself to be precipitated from that solution, by means of an acid—but without the precipitate being in any manner attacked, whatever be the quantity of the acid employed. When separated by the filter, and dried, it remains under the form of an exceedingly fine white powder, which does not change its colour even at a red heat. If the remaining mass be treated with acids, the same powder is obtained. Its specific gravity, after being brought to red heat, is 6.500. It is fusible by the blowpipe, by the addition of alkaline phosphate and borate of soda, but communicates no colour to the flux.

Exposed to a strong heat in a crucible, without any other mixture than pounded charcoal, it is reduced to a button moderately hard, having some metallic splendour at its surface, but a dull blackish fracture. Acids have no other action on this kind of regulus, but that of bringing it to the state of white oxide in which it was before. The circumstances of the reduction, as well as the specific gravity of this singular substance, seem to assign it a place among the metals, and I have sufficient reasons for being persuaded that it is none of those already known. The substances with which it might be confounded are the oxides of tin, tungsten, and titanium, which are soluble in caustic alkalies, and which, under some circumstances, resist acids. But the oxide of tin is easily dissolved and reduced: tungsten immediately discovers itself by its solubility in ammonia, and by the blue colour which it communicates to phosphate of soda: the oxide of titanium gives a hyacinth colour to borax, and becomes soluble in acids by fusion with carbonate of potash.

Before I describe the chemical analysis which I undertook of the two substances, which I consider as ores of the new metal, it is proper I should give a description of their external characters. In order to avoid circumlocution, when necessary to name them I shall venture to give them a generic denomination. Taking advantage of the usage which admits mythologic appellations, and to express the property which the new metal has, of not becoming saturated with the acids in which it is immersed, I shall apply to it the name of *Tantalus*. For the ore composed of tantalus, iron and manganese I propose the name of *tantalite;* and for the ore containing yttrie, that (*Turn to next page*)

ENGINEERING

Pipe Filled With Sodium Used As Conductor of Electricity

FOUR-INCH iron pipe filled with the unstable metal sodium is a novel conductor of electricity that has been giving satisfactory service for several years in an electrochemical plant at Midland, Mich. It carries as much as 4000 amperes of current, a job that is almost universally done by copper.

The late Dr. H. H. Dow made the installation in an effort to prove that sodium could be used to better advantage than copper to conduct large direct currents, R. H. Boundy told the Electrochemical Society. Mr. Boundy believes that even now, with copper at its present low cost, use of the sodium conductors would be justified for certain installations.

Although the resistance of sodium is three times that of copper, it weighs only one-ninth as much as the familiar electrical conductor. Hence, to carry the same amount of current, a sodium conductor has to be almost three times as large in cross-sectional area as one of copper. But a yard of the sodium conductor would not be nearly so heavy as a corresponding length of copper.

Sodium is one of the widely distributed of metals. A common form in which it occurs is table salt, chemically known as sodium chloride. The metal will not exist in nature as the uncombined element because air quickly tarnishes it and water readily reacts with it. As the pure metal, it is soft and silvery, with low melting point.

of *yttrotantalite,* which will not be found longer than that of *siderotitanite.* . . .

Vanadium

UEBER DAS VANADIN . . . (On Vanadin, a new Metal, found in bar iron from Eckersholm, an iron foundry which gets its ore from Taberg in Smoland); by N. G. Sefström. From Kongl. Vetensk. Acad. Handl. f. 1830. *Published in Annalen der Physik und Chemie (Poggendorff), Bd. XXII. Leipzig,* 1831.

MANY YEARS AGO the Bergmeister Rinmann devised a method for easily detecting whether an iron were cold-short, which depends upon the circumstance that such an iron upon etching with hydrochloric acid gives a black powder. On one occasion, when I needed an iron which was not cold-short, and for the purpose investigated iron from Eckersholm by this method, which I have described in the Annalen des Eisencomtoirs for 1825, S. 155., it gave, to my astonishment, the reaction for cold-shortness, although the iron from Taberg is considered the softest and toughest that we have. Time did not then allow me to clear up this behavior; but in April, 1830, I took up the investigation again, in order to see whether the black powder contained phosphorus, or consisted of some other material which it was important for me to know. Accordingly I dissolved a considerable amount of this iron in hydrochloric acid and examined the remaining black powder. During the solution the circumstance appeared that part of the iron, especially that setting free the black powder, dissolved faster than the rest, so that in the middle of the iron bar hollow veins were left.

Upon analysis of the black powder there were found in it silica, iron, alumina, calcium, copper, cobalt, and a substance which in certain respects resembled chromium and in others uranium. In what combinations these substances occurred could not be determined, since the small amount of black powder did not exceed 2 decigrams, and of this more than half was composed of silicic acid.

After several tests it was discovered that it was not chromium, and the following comparisons show also that it is equally unlikely that it is uranium. In this it is to be noted that the highest oxidation products were compared with one another, that, however, Vanadium resembles tellurium in its lower oxidation forms.

REACTIONS OF URANIUM OXIDE	REACTIONS OF VANADIN
Solution in Hydrochloric Acid	
Color: pure yellow	Color: orange yellow
Behavior with Ammonium Hydroxide	
Gives a yellow precipitate, especially upon warming	Gave no precipitate and with excess of ammonia the solution upon warming became colorless
With Ammonium Carbonate in Excess	
Is precipitated on heating	Is not precipitated
With Potassium Ferrocyanide	
Gives a brown precipitate	Gave a green precipitate
BEFORE THE BLOWPIPE	
With large admixture of Borax	
The yellow glass becomes colorless, but not the green	The green glass may become colorless, but not the yellow
With Soda in the Oxidizing Flame	
Does not dissolve in it	Is easily dissolved in it

These reactions were later confirmed in the month of May in the laboratory of Prof. Berzelius. The metal was reduced by roasting in hydrogen gas, and it was thus discovered that it possesses a lower oxidation compound, giving with acids a blue-green solution, and that this as well as the higher oxide is soluble in alkalies.

A complete analysis could not be made at that time on account of other matters; and the small supply, amounting to less than 2 centigrams, was used up.

In the autumn the research was again taken up and then carried on in the laboratory of Prof. Berzelius. There the new metal was first isolated from the iron bars; but the yield even from several pounds of dissolved iron amounted to so little, that I procured a quantity of slag from the iron, from which I got a sufficient amount for investigation.

Name of the New Metal

Since this makes no difference to it, I have derived it from *Vanadis,* an alternate name of Freya, the most important goddess in Scandinavian mythology. . . .

Science News Letter, October 8, 1932

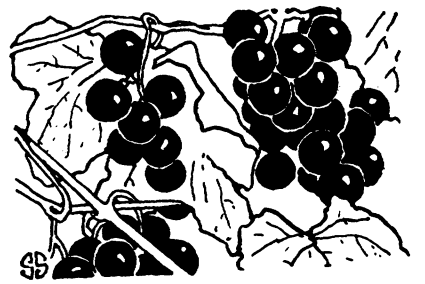
Commercial dress pattern manufacturers have adopted 29 of the designs for children's clothing developed by the U. S. Bureau of Home Economics.

No perfect method of "moisture proofing" wood has yet been found, but government tests show that some coatings reduce the rate of moisture absorption materially.

BOTANY

NATURE RAMBLINGS

by Frank Thone



Fruit of Vinland

THE FIRST light touches of frost are mellowing the sharp tang of the wild grapes, and in a thousand thickets and riverside tangles small boys and other boys not so small are putting purple linings in their mouths. Wild grapes are small and inclined to run to seeds, but there is some sort of atavistic appeal about their flavor that has somehow been bred out of their politer cousins of the cultivated vineyards.

There are a number of different kinds of wild grapes in the eastern part of North America, and all of them have their virtues. Two especially, the fox grape of the Middle Atlantic and New England states and the Catawba grape of the middle South, have contributed heavily to the ancestry of all the fine domestic table varieties. It was a wild grape, probably the fox grape, that left one of the strongest of early impressions of America: the Vinland of Lief, son of Eric, was so called because of its abundance of grapes.

Farther west, the smaller, more strongly flavored wild grape known variously as wolf grape and river grape has been less amenable to culture. It has been only within the last couple of decades that breeders out in Dakota have bethought them to cross it with the Concord, thus establishing a racy-flavored, medium-sized grape of tremendously rapid growth and extreme hardiness that will resist even the blizzards of the plains and western prairie lands. This is the Beta grape. Whoever does not have it in his vineyard or arbor is missing something which a true grape lover ought to know.

Science News Letter, October 8, 1932