XVIII. Extract from a memoir on a new metal called tellurium

Professor Klaproth

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and the cork L, to which the two former are fastened. At *e* is a piece of lead, which serves at the same time to adjust the weight of the ball, and to keep it in an upright position.

Fig. 3 is a plan of the cork, showing the apertures through which the liquor descends. The tubes D and F are each in two parts, joined by pieces of elastic gum, by which means the apparatus admits of being moved without danger of breaking. There is also a glass rod *e* in the vessel A for the purpose of stirring the materials. This rod passes tight through a piece of gum elastic (the mouth end of one of the common bottles made of that substance), the other end of which is fitted close to the mouth of the vessel A, by means of wire or catgut wound round it, to prevent the escape of the gas.

XVIII. *Extract from a Memoir by Professor KLAPROTH, on a new Metal called Tellurium, read in a public Sitting of the Academy of Sciences at Berlin, Jan. 25th, 1798.*

PROFESSOR Klaproth, on subjecting to a chemical analysis the ore of the auriferous mine known under the denomination of the mine of white gold, *aurum paradoxum, metallum vel aurum problematicum**, found in that mineral a metal absolutely different from any hitherto known, and to which he gave the name of *tellurium*, as a companion to the *uranium* and *titanium*, new metals discovered some time ago by the same chemist. M. Muller of Reichenstein had, so early as 1782, suspected that this ore contained a peculiar metallic substance, and his suspicion was confirmed by Bergman, to whom he had sent some of the ore; but an account of the small quantity with which he had made his experiments he would not venture to decide, whether it contained a new

* This ore is found in the mine called *Mariahilf* in the Fatzbay mountains near Zalethna in Transylvania. See Emmerling *Elemens de Mineralogie*, t. xi. p. 124.

metal, or whether what had been taken for a particular kind of metal might not be only antimony. The repeated and ingenious experiments made by M. Klaproth on a more considerable quantity of the ore, which had been transmitted to him by M. de Reichenstein, fully confirmed the conjectures of the latter as well as those of Bergman.

Process for obtaining the Metal from the Ore.

1. The ore is gently heated with six parts of the muriatic acid; three parts of the nitric acid being then added, the mixture is boiled; upon which there arises a very considerable effervescence, and a complete solution is obtained.

2. The filtered solution is diluted with as much water as it can bear without becoming turbid, which is a very small quantity, and a solution of caustic potash is then added to the liquor, until the white precipitate which is at first formed disappears again, and nothing remains but a brown flaky sediment.

3. This last precipitate is the oxyde of gold mixed with the oxyde of iron, and a separation is effected by the common means.

4. The muriatic acid is added to the alkaline solution (2) in sufficient quantity to saturate the alkali entirely: an excess of the acid must be avoided. A white precipitate, which, by heat, settles at the bottom of the vessel under the form of a heavy powder, is produced in great abundance. After the precipitate has been washed and dried, it is formed into a kind of paste with a sufficient quantity of any fat oil; and this mass is put into a small glass retort, to which a recipient is slightly fitted. When this arrangement is made, it is gradually brought to a red heat; and in proportion as the oil is decomposed, there are observed, as in the distillation of mercury, brilliant and metallic drops which cover the upper part of the retort, and which, at intervals, fall to the bottom of the vessel, and are immediately replaced by others. After it has cooled, metallic fixed drops are found adhering to the sides of the retort and at the bottom of the vessel, and the remainder

remainder of the metal reduced and melted with a brilliant surface, and almost always crystallized.

Essential characterizing Marks of this new Metal.

1. It has the white colour of tin, approaching to the gray colour of lead. Its metallic splendour is considerable, and its fracture laminated. It is highly brittle and friable. By suffering it to cool quickly and gradually, it readily assumes a crystallized surface.

2. Its specific gravity is 6.115.

3. It belongs to the class of the most fusible metals.

4. When heated by the blow-pipe upon charcoal, it burns with a very lively flame of a blue colour, inclining at the edges to green. It is so volatile as to rise entirely in a whitish gray smoke, and exhales a disagreeable odour like that of radishes. On ceasing to heat it, without having entirely volatilized the small portion subjected to this operation, the button which remained, retained for a long time its liquidity, and, by cooling, was covered with a radiated vegetation.

5. This metal amalgamates easily with mercury.

6. With sulphur it forms a gray sulphure of a radiated structure.

7. A solution of it in the nitric acid is transparent and colourless. When concentrated, it produces, in time, small white light crystals, in the form of needles, which exhibit a dendritic aggregation.

8. The new metal dissolves in the nitro-muriatic acid. When a large quantity of water is added to such a saturated solution, the metal is precipitated in the state of an oxyde, under the form of a white powder, which, in this state, is soluble in the muriatic acid.

9. By mixing cold, in a well-stopped vessel, a small quantity of this metal with a hundred times its weight of concentrated sulphuric acid, the latter gradually assumes a beautiful crimson red colour. By means of a small quantity of water added, drop by drop, the colour disappears, and the small

finall quantity of the metal dissolved, deposits itself under the form of black flakes. Heat destroys the solution : it makes the red colour disappear, and disposes the metal to separate in the state of a white oxyde.

10. When, on the other hand, the concentrated sulphuric acid is diluted with two or three parts of water, and a small quantity of the nitric acid has been added, a considerable quantity of the metal will then be dissolved. The solution is transparent and colourless, and is not decomposed by the mixture of a larger quantity of water.

11. All the pure alkalis precipitate from acid solutions of this metal an oxyde, of a white colour, soluble in all acids : by an excess of alkali, the precipitate which is formed is entirely re-dissolved. If carbonate be employed instead of pure alkali, the same phenomenon takes place—with this difference, however, that, by excess of the latter, the precipitate formed is re-dissolved only in part.

12. Exceedingly pure prussiate of potash produces no precipitate in solutions of this metal.

13. Alkaline sulphurets mixed with acid solutions occasion a brown or blackish precipitate, according as the metal is combined with more or less oxygen. It sometimes happens that the colour of the precipitate has a perfect resemblance to mineral kermes, or red sulphurated oxyde of antimony.

When the sulphuret of tellurium is exposed on burning charcoal, the metal burns with a blue colour conjointly with the sulphur.

14. The infusion of gall-nuts, combined with the same solutions, gives birth to a flaky precipitate of an Isabella colour.

15. Iron and zinc precipitate tellurium from its acid solutions in a metallic state, under the form of small black flakes, which resume their splendour by friction, and which, on burning charcoal, melt into a metallic button.

16. Tin and antimony produce the same phenomenon with the acid solutions of the new metal.

The precipitate formed by the antimony proves, in a striking manner, that tellurium is not a disguised antimony, as has been supposed. A solution of tin in the muriatic acid, mixed with a solution of tellurium in the same acid, produced also a black and metallic precipitate.

17. The oxyde of tellurium, obtained from acid solutions by alkalis, or from alkaline solutions by acids, are both reduced with a rapidity resembling detonation, when they are exposed to heat on charcoal. It burns, and is volatilised, as has been already mentioned.

18. By heating for some time this oxyde of tellurium in a retort, it melts, and appears, after cooling, with a yellow straw colour, having acquired a sort of radiated texture.

19. Mixed with fat bodies, the oxyde of tellurium is perfectly reduced by the method above pointed out.

The ore of white gold of Fatzebay, *aurum vel metallum problematicum*, contains: tellurium 925.5, iron 72.0, gold 2.5, total 1000.0.

The graphic gold of Offenbanya contains: tellurium 60, gold 30, silver 10: total 100.0.

Ore from the mine known under the name of the yellow mine of Nagyag contains: tellurium 45, gold 27, lead 19.5, silver 8.5, sulphur one atom: total 100.0.

Ore from the mine known by the name of the mine of gray foliated gold of Nagyag contains: lead 50, tellurium 33, gold 8.5, sulphur 7.5, silver and copper 1: total 100.0