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PART I.
ORIGINAL COMMUNICATIONS.

ART. I.—*On some Compounds formed by the Action of Chloride of Platinum and Chloride of Tin.* By ROBERT J. KANE, M. R. I. A., Professor of Chemistry to the Apothecaries' Hall of Ireland, Corresponding Member of the Societies of Pharmacy and of Medical Chemistry, of Paris, &c. &c.

AN accidental observation of the intensely red colour produced by mixing solutions of proto-chloride of tin and of per-chloride of platinum, induced me to examine into the nature of their mutual reaction at considerable length. I had very nearly reached the termination of my labours, when the records of them were, by some accident, mislaid; and except so far as my memory could serve, I lost every corrected statement of those results, to obtaining which I had devoted a space of many months. I resolved to recommence the investigation at a future period. I have subsequently attempted to put that resolution into practice, but have not been able to devote to it the necessary time. Still less do I now see any probability of having at my disposal

sufficient leisure; and have therefore resolved, as I cannot again myself complete this train of research, to bring forward such a general account of the novel phenomena that I observed, as may have the effect of inciting others to the task. I fortunately possessed in the laboratory book such accounts of the experiments as may be sufficient for that purpose.

A solution of the chloro-stannite of ammonium (first described by my friend Dr. Apjohn) was placed to evaporate in an unglazed biscuit ware capsule, in which there had been many weeks before chloride of platinum. The tin solution gradually became coloured red, and seeking for the cause of this, it appeared that the trace of platinum, which the dish had absorbed, was sufficient to colour intensely the solution of the chloro-stannite. To verify this rationale I mixed together solutions of proto-chloride of tin and per-chloride of platinum. A splendid red colour was immediately produced. To determine the nature of the body formed by the union of the two chlorides, and which possesses this brilliant tint, was the object of my future investigations.

Per-chloride of platinum and crystallized proto-chloride of tin were dissolved separately in small portions of water, and the solutions mixed: they became instantly of an intense wine red colour. This red liquor was divided into two equal portions; one portion was evaporated very cautiously nearly to dryness, when on cooling it solidified into a mass of intensely deep red crystals, very deliquescent, and staining the skin brown. They were soluble in a small quantity of water, in alcohol and in ether; these solutions were red. When they were evaporated the substance again separated in the crystalline form. It crystallized more readily from its etherial than from its alcoholic or watery solution.

These crystals are in plates, presenting an appearance like *moirée metallique*. When heated they give out much water acidulated with muriatic acid, (they had not been well dried), some chloride of tin, and finally, after having been subjected

to a full red heat, metallic platinum and some peroxide of tin remains behind.

Although soluble in a small quantity of water, this substance is totally decomposed by a larger quantity; a red powder separating, which, when dried, becomes brown. These crystals are soluble in muriatic acid; the solution is reddish brown, and contains proto-chlorides of tin and platinum; the addition of potash not producing the separation of any chloro-platinate of potassium.

These crystals are, as was mentioned before, decomposed by much water: in order to examine the products of this decomposition, a quantity of the crystals was mixed with a large quantity of water; a considerable quantity of red precipitate immediately fell: this was separated by the filter.

The liquor was acid. It contained free muriatic acid, a mixture of proto-chloride of tin, and much per-chloride. It did not contain any platinum.

The precipitate in drying became of a brown colour; it had not any trace of crystalline structure. It was totally indissoluble in water. When heated it gives out a white vapour which reddens litmus paper, and condenses into a white solid matter (chloride of tin). Metallic platinum, mixed with some peroxide of tin, remains behind.

When acted on by nitric acid it forms a yellow liquor, from which per-oxide of tin is separated. When digested with muriatic acid it dissolves, forming a fine red solution, very similar to the original one. When acted on by an alkali, a black powder is formed. We shall recur to the detail of these reactions presently.

In order to analyze this powder, the following method was pursued:

Twenty grains of the red powder were boiled in water of ammonia until it was converted totally into the black powder. The water of ammonia was then neutralized, and nitrate of silver added. Chloride of silver was thrown down, which when

dried weighed 18.2 grains, equivalent to 4.48 grains of chlorine.

Twenty grains of the red powder were boiled in aqua regia until they dissolved entirely. The solution was then evaporated nearly to dryness. Nitric acid was added to it in excess and it was again evaporated: when nearly dry a quantity of water was poured on it, when a considerable quantity of per-oxide of tin was precipitated, which, separated by the filterer and ignited, weighed 12.2 grains, equivalent to 9.6 grains of metallic tin.

The liquor from which the tin was thus separated contained all the platinum as per-chloride. It was considerably concentrated and then mixed with sal-ammoniac and alcohol. The scarcely soluble chloro-platinate of ammonium which was thrown down having been collected, weighed 10.7 grains, equivalent to 8.13 grains of bi-chloride, or to 4.73 of metallic platinum.

By this analysis there were obtained from twenty grains of the powder,

Chlorine	=	4.48
Tin	=	9.60
Platinum	=	4.73
		<hr/>
		18.81
		<hr/>

The platinum existed evidently as proto-chloride, and it is very probable that the rest of the chlorine existed in the state of proto-chloride of tin. Now the platinum, united with 1.69 grains of chlorine to form proto-chloride, and the remaining 2.79 grains of chlorine converts into proto-chloride 4.64 grains, or very nearly exactly one half of the tin. In what state of combination was the other half? Let us call to mind that when proto-chloride of tin is decomposed by much water, a white powder falls which contains pro-toxide and proto-chloride of tin, the tin being evenly divided between the two. It is evident that the proto-chloride of tin, existing in the crystalline substance, was decomposed by the large quantity of water, and

we consequently obtained as much prot-oxide as proto-chloride of that metal in the precipitate.

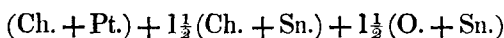
Arranging, therefore, the results of the analysis on this principle, we shall have

4.73 Platina	4.73 Platina	}	= 6.42 Chloride of platina.
	1.69 Chlorine		
4.48 Chlorine	2.79 Chlorine	}	= 7.43 Chloride of tin.
	4.64 Tin		
9.60 Tin	4.96 Tin	}	= 5.65 Oxide of tin.
	.69 Oxygen		
<hr/> 18.81			
			<hr/> 19.50
			.50 loss.
			<hr/> 20.00
			<hr/>

Now calculating the atomic relations existing between these proportions, we find them approximating very closely to

1 atom proto-chloride of platina	= 134.20
$1\frac{1}{2}$ atom proto-chloride of tin	= 121.45
$1\frac{1}{2}$ atom pro-toxide of tin	= 100.35
	<hr/> 356.00

and its formula,



On that supposition the precipitate would contain in twenty grains,

Proto-chloride of platina	= 7.56
Proto-chloride of tin	= 6.82
Pro-toxide of tin	= 5.62
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There is a slight deficiency in the quantity of platina detained by experiment, and a trivial excess in the quantity of proto-chloride of tin. But the coincidence is sufficiently close to warrant us in considering such to be the real composition of this body.

This substance is soluble in muriatic acid. The solution is of a fine red colour, like the original liquor from which it had been precipitated. It is not decomposed by water if the muriatic acid be considerably in excess. This solution, when evaporated, gives a soft crystalline mass, very acid, and resolvable in water. These crystals were evidently composed of the chloro-platinite of tin, united to chloride of hydrogen (muriatic acid), and were evidently analogous to the oxygen salts which crystallize with oxide of hydrogen (water) in combustion.

When this acid solution is mixed with solution of corrosive sublimate, a very interesting effect is produced. The brown powder is again thrown down, the corrosive sublimate uniting with the muriatic acid. If the solutions be boiled together, a different effect is produced; the proto-chloride is converted into per-chloride of tin, while the corrosive sublimate loses either one-half or the whole of its chlorine.

We know that the proto-chloride of platinum and the proto-chloride of tin are both slightly negative, and their compound should therefore act feebly as a chlorine acid. Hence it unites with the positive chloride of hydrogen, forming a crystalline compound; from which, corrosive sublimate, being a much stronger acid, takes away the base; or we may suppose the muriatic acid to combine separately with chlorides, and a mere mixture of chloro-stannite and of chloro-platinite of hydrogen to exist in solution. Which ever view we adopt will have many analogous cases amongst the oxygen combinations. The former is that which I prefer in consequence of the red colour which a mere mixture should not possess.

By the action of much water the crystals are decomposed into this reddish brown powder and muriatic acid. From the analysis of the powder I therefore consider the crystals to be composed of one atom of proto-chloride of platinum, and three atoms of proto-chloride of tin. Its formula is $(\text{Ch.} + \text{Pt.}) + 3(\text{Ch.} + \text{Sn.})$

When ammonia acts on the crystals or on the red powder, it

takes away the chlorine, and as much water is decomposed as converts the metals into prot-oxide and the chlorine into muriatic acid. Sal-ammoniac exists in the liquor, and there remains a jet black brilliant crystalline powder, which consists of platinum and tin, both in the state of pro-oxide.

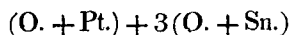
This substance is insoluble in water, soluble in muriatic acid. The solution is olive coloured, and containing platinum and tin, both in proto-combination. This solution is decomposed by water except it contains a considerable excess of acid. The precipitate is of a dirty white colour. Solution of sal-ammoniac did not dissolve this powder. It was not acted on by solution of nitrate of silver or of ioduret of potassium.

When heated nearly to redness there appeared a sudden scattering, as if from an explosive disengagement of gas, and immediately afterwards it suddenly glowed intensely as if burning like tinder. During this combustion no gas was disengaged. When the process was carried on in close vessels there was a slight absorption of oxygen, but the combustion took place, though less completely, in hydrogen and carbonic acid. After this ignition the powder preserved all its external character. It was, however, then insoluble in muriatic acid, and soluble in aqua regia. The solution contained per-chlorides of platinum and tin.

It is easy to explain this phenomenon. The black powder is a combination of prot-oxide of platinum and prot-oxide of tin. The former substance is decomposed at a low red heat, giving out oxygen in which the prot-oxide of tin burns. The oxide of platinum does not yield enough of oxygen to convert the whole of the prot-oxide of tin into per-oxide, and therefore the combination is less brilliant in carbonic acid than in atmospheric air.

The ammonia, by acting on the brown powder, takes away nothing but muriatic acid; the metals remain in the same proportions as in the brown powder, but both in the state of prot-oxide. If, therefore, the analysis given above of that powder

be correct, this brilliant black crystalline substance is composed of one atom of prot-oxide of platinum, and three atoms of prot-oxide of tin. Its formula is



When this crystalline powder is digested in solution of potash it loses its brilliant appearance and becomes dull. The liquor contains prot-oxide of tin. The dull black powder is prot-oxide of platinum. When the reddish brown powder, or the red crystals are digested in solution of potash the same effect is produced; the chlorine and oxide of tin being dissolved, and the oxide of platinum alone remaining behind. If the potash be considerably in excess, it takes up a quantity of the oxide of platinum, and becomes greenish coloured. This oxide of platinum dissolves rapidly in muriatic acid.

I hope that the above description of these compounds may be found sufficiently interesting to lead to a more perfect investigation. It must be imperfect to a certain extent, and I only bring the subject now forward that it may be more completely investigated by others.

ART. II.—*Report of a Case of Urinary Calculi, containing Human Teeth, removed from the Female Bladder.* By
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MARY MAC MAHON, a labouring woman, aged fifty years, was admitted into the county of Clare infirmary, on the 9th of October, 1833, suffering from symptoms of stone in the bladder. She complained of severe pain, and appeared much harassed and reduced by the complaint.

The account she gave of her previous state of health was not very satisfactory; from her statement, however, it appeared