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## XXXI. *Analysis of some Combinations of Platina.* *By* R. J. KANE, *M.R.I.A. Professor of Chemistry to Apothecaries' Hall, Dublin*: with Observations by* R. PHILLIPS, *F.R.S. &c.*

MR. KANE prepared iodide of platina by adding a solution of hydriodate of potash to a dilute solution of permuriate of platina, the latter being in excess; a black precipitate was formed, which consisted of iodide of platina mixed with the double chloride of potassium and platina; the latter was dissolved by putting the precipitate into a large quantity of water, and keeping it at a temperature of 200°. The insoluble residue was iodide of platina, which when cautiously dried had the following properties: its colour was dull black, rather heavy, insoluble in warm water, but by long boiling in water, traces of iodine were perceptible, arising from the decomposition of a minute portion of the iodide. Alcohol and æther did not appear to act upon it; when heated to 250° it began to give out iodine copiously, and below a red heat it was totally decomposed, leaving metallic platina. Neither sulphuric, nitric, nor muriatic acid acted upon it when cold; but a mixture of the two latter dissolved it, permuriate of platina being formed, and iodine expelled. Solution of potash dissolved the iodide of platina, the colour of the solution was yellow; when saturated with nitric acid it became of a claret colour, more acid rendered it colourless, and by alcohol it was resolved into a mixture of metallic platina and iodine.

A solution of hydriodic acid dissolved the iodide of platina, the solution was red: it was dissolved also by a solution of hydriodate of potash, and its colour was deep claret; when the iodide was put into a solution of ammonia, it became first greenish, then brown, and finally of a clear Indian red; the supernatant liquor was yellow, it contained excess of ammonia, and by evaporation deposited minute red crystals.

To determine the composition of the iodide it was decomposed by heat; 100 grains left 35 of platina, and consequently 65 of iodine were dissipated: on repeating the experiment there was but a slight variation in the result. Now a compound of 3 atoms of iodine ($126 \times 3$) 378, and 2 atoms of platina ($96 \times 2$), $192 = 470$, would give 66·3 of iodine, and 33·7 of platina per cent. It appears, therefore, that this substance is a sesqui-iodide, composed of

| | | | |
|---|---|---|---|
| 1½ equivalent of iodine (126 + 63) | 189 | or | 66·3 |
| 1 —— platina . . . . . | 96 | | 33·7 |
| | 285 | | 100· |

* From the Dublin Journal of Medical and Chemical Science, for July 1832.

Mr. Kane prepared the iodide of potassium and platina, by adding an excess of the former in fine powder to a strong solution of permuriate of platina; effervescence took place. Some æther was immediately poured on the mass, and the whole agitated for a few minutes; a black powder was formed, which when separated by the filter was the double iodide, mixed with some chloride of potassium. This double salt, when pure, is very soluble in water, the solution is of a magnificent claret colour; it is not decomposed by evaporation, but yields a soft crystalline mass; the form of the crystal could not be determined. It is soluble in alcohol, but not in æther, and when it is added to a strong aqueous solution, the æther precipitates the salt in the state of a black powder; solution of potash dissolves it.

This double iodide of potassium and platina was thus analysed:—Twenty grains were heated until the iodine was expelled from the iodide of platina, and there remained metallic platina mixed with iodide of potassium; the latter was dissolved in water; the solution by evaporation left 7·75 grains of iodide of potassium, and the platina weighed 4·75 grains, consequently 7·5 grains of iodine were expelled by heat. It appears therefore to be composed of

| | |
|---|---|
| Iodide of potassium . . . . . | 7·75 |
| ——— platina . . . . . | 12·25 |
| | 20· |

Mr. Kane observes, that "7·5 iodine to 4·75 platinum is very nearly in the ratio of 1½ atom of iodine to 1 atom of platinum,—thus proving the accuracy of the previous analyses;" and he regards the true composition of the double salt to be 1 atom of each iodide. The results above mentioned certainly prove the *inaccuracy* of the previous or of the present analysis; for 7·5 iodine + 4·75 platina form a compound exactly intermediate between a sesqui-iodide, and a prot-iodide.

The next compound which Mr. Kane formed, he terms Iodo-platinate of hydrogen; it was formed by adding an iodide of platina to a strong solution of hydriodic acid. The solution had a fine claret colour; by cautious evaporation small grains were obtained which were soluble in water, and the solution was red. From the facility with which it was decomposed, Mr. Kane could not ascertain its composition.

The last compound is called Iodo-platinate of ammonium. It was procured by adding solution of ammonia to that of the above-named iodo-platinate of hydrogen. The ammonia caused a black precipitate, which in a few minutes passed

through various shades of brown, and finally became a fine clear Indian red. The solution is stated to contain much ioduret of ammonium:—this iodo-platinate of ammonium is stated to consist of

| | |
|---|---|
| 5 atoms of [*sesqui*] iodide of platinum (285 × 5). . | 1425 |
| 1 atom of ioduret of ammonium . . . . . | 144 |
| | 1569 |

*Observations on the above Compounds.*—In the Dublin Journal for January last, Mr. Kane has published a notice of a paper by M. Lassaigne, announcing that he also had prepared and analysed two iodides of platina; and Mr. Kane expresses his anxiety to secure what he considers to be his prior claim to the discovery of this compound. M. Lassaigne's paper is contained in the *Ann. de Chim. et de Phys.* for October last, it has not however long appeared. Supposing that the compounds obtained by Mr. Kane and M. Lassaigne were similar (which they are not), the priority unquestionably belongs to M. Lassaigne: his paper in the *Ann. de Chim. et de Phys.* just alluded to, begins thus: "Les combinaisons du platine avec l'iode n'avaient pas encore été obtenues ni étudiées, lorsque j'annoncai en 1829, dans le numéro de Juillet du *Journal de Chimie médicale et de Pharmacie*, qu'on pouvait préparer un iodure de platine à proportions définies en faisant agir la solution d'iodure de potassium sur celle de bi-chlorure de platine." M. Lassaigne then states, that the iodide of platina, which he had formed, appeared to consist of 4 atoms of iodine and 1 atom of platina, and that he declared his intention of trying to procure an iodide containing less iodine. In this, as I shall presently show, he has since succeeded.

It is evident that Mr. Kane never saw the *Journal de Chimie médicale* for 1829; for if he had, he could not have made the following statement, headed PRIORITY OF DISCOVERY OF THE IODIDE OF PLATINUM:—"I would direct the attention of my readers to a paper, published in this Journal in July, 1832, on the iodide of platinum and its saline combinations, in which I described that substance at length, developed the history of the compounds it forms with the iodides of the basic [basic?] metals, and enumerated all the important facts in its history. It is a source of the highest gratification to me, that so eminent a chemist as Lassaigne has followed the same train of research, and fully established the accuracy of my investigations by their close coincidence with his results." Mr. Kane adds, "there is but one point on which we differ:"—now the following comparative statement will show that there is no one point on which they agree.

The compounds analysed by Mr. Kane are,

Sesqui-iodide of platina, composed of

| | | |
|---|---|---|
| 1½ atom of iodine (126+63) | 189 | or 66·3 |
| 1 ——— platina . . . . . | 96 | 33·7 |
| | 285 | 100· |

Double iodide of platina and potassium, composed of

| | |
|---|---|
| Sesqui-iodide of platina . . . . . | 61·25 |
| Iodide of potassium . . . . . | 38·75 |
| | * 100· |

Iodo-platinate of ammonium, consisting of

| | | |
|---|---|---|
| 5 atoms of sesqui-iodide of platina (285 × 5). . | 1425 | or 90·83 |
| 1 atom of ioduret of ammonium . . . . . | 144 | 9·17 |
| | 1569 | 100· |

The following are the results of M. Lassaigne's analyses; in stating which I have accommodated the atomic weights to those above given.

Prot-iodide of Platina.

| | | |
|---|---|---|
| 1 atom of iodine . . . . . | 126 | or 56·76 |
| 1 ——— platina . . . . . | 96 | 43·24 |
| | 222 | 100· |

Bi-iodide of Platina.

| | | |
|---|---|---|
| 2 atoms of iodine . . . . . | 252 | or 72·42 |
| 1 atom of platina . . . . . | 96 | 27·58 |
| | 348 | 100· |

Iodide of Platina and Potassium.

| | | |
|---|---|---|
| 1 atom of bi-iodide of platina . . . . | 348 | or 67·71 |
| 1 ——— iodide of potassium . . . . | 166 | 32·29 |
| | 514 | 100· |

Hydriodate of Ammonia and Platina.

| | | |
|---|---|---|
| 2 atoms of bi-iodide of platina . . . . | 696 | or 82·86 |
| 1 atom of hydriodate of ammonia . . | 144 | 17·14 |
| | 840 | 100· |

Hydriodate of Bi-iodide of Platina.

| | | |
|---|---|---|
| 1 atom of bi-iodide of platina . . . . | 348 | or 73·27 |
| 1 ——— hydriodic acid . . . . . | 127 | 26·73 |
| | 475 | 100· |

In a future Number I shall give further extracts from M. Lassaigne's paper; at present I would only ask Mr. Kane to

* This is according to Mr. Kane's analysis; but if the compound were really what he states it to be, it would consist of

| | |
|---|---|
| Sesqui-iodide of platina..... | 63·2 |
| Iodide of potassium..... | 36·8 |
| | 100· |

point out the similarity between these results and his. M. Lassaigne's iodides of platina are two,—the prot-iodide and the bi-iodide; Mr. Kane's only iodide is a sesqui-iodide; M. Lassaigne's iodide of platina and potassium contains 1 atom of bi-iodide of platina, and 1 atom of iodide of potassium; Mr. Kane's (of questionable accuracy), 1 atom of sesqui-iodide of platina, and 1 of iodide of potassium. M. Lassaigne mentions an hydriodate of ammonia and platina, consisting of 2 atoms of bi-iodide of platina and 1 of hydriodate of ammonia. Mr. Kane has what he calls an iodo-platinate of ammonium, containing 5 atoms of sesqui-iodide of platina, and 1 atom of ioduret of ammonium.

Mr. Kane seems to claim great credit for the more philosophical manner in which he views the nature of the iodides of platina than M. Lassaigne does. M. Lassaigne "examined the compounds of iodide of platinum with iodide of potassium, &c. as double iodides; whilst I investigated them as iodine salts, in which the iodide of platinum is the electro-negative (acid) element," &c. &c. I confess I wish Mr. Kane would return to the simpler views entertained by M. Lassaigne; for I am afraid that at the rate at which innovation in nomenclature is proceeding, every month will produce a new language; for if when two iodides combine, one must be an acid and the other a base, I do not see why any compounds whatever may not be at the same time acids, alkalies, and salts. I had intended to make some further remarks on Mr. Kane's nomenclature, but these I shall postpone. In concluding I would observe, that in line 7, p. 310, vol. i. of the Dublin Journal, in Mr. Kane's paper, iodide of potassium is printed instead of iodide of platinum; and in p. 311, line 6 from the bottom, the sentence "its formula ($I\frac{1}{2}$ I + Pl.) + (I + Pl), and its atomic weight = 471," should be ($I\frac{1}{2}$ I + Pl) + (I + K), and its atomic weight = 451; for Mr. Kane has just before mentioned the composition to be a compound of 1 atom of sesqui-iodide of platina, and 1 of iodide of potassium.

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XXXII. *On the Theory of Magnetic Electricity.* *By* Mr. Wm. Sturgeon, *Member of the British Association for the Promotion of Science; Lecturer at the Hon. East India Company's Military Academy, Addiscombe, &c. &c.*

[Continued from p. 37.]

THE theory of electric excitation by magnetic agency will be embraced in the following Positions: —

*Position* 1.—Magnetic electricity may be excited in all the metals, and perhaps in some other conductors of electricity.