XVIII. Arithmetical analysis of mixed salts of potassium and sodium

John Joseph Griffin

To cite this article: John Joseph Griffin (1838) XVIII. Arithmetical analysis of mixed salts of potassium and sodium , Philosophical Magazine Series 3, 13:80, 132-135, DOI: [10.1080/14786443808649541](https://doi.org/10.1080/14786443808649541)

To link to this article: <http://dx.doi.org/10.1080/14786443808649541>

Published online: 01 Jun 2009.

Submit your article to this journal [↗](#)

Article views: 2

View related articles [↗](#)

perfect combustion. This relation, according to weight and volume, is given in the second and third columns.

For example, 100 volumes being taken, the Lancashire coal gives out more heat than the same volume of Edinburgh coal by a quantity expressed by 17·91: and 100 parts by weight being taken, the former coal surpasses the latter in the heat evolved by the quantity expressed by 17·83.

XVIII. *Arithmetical Analysis of mixed Salts of Potassium and Sodium.* By JOHN JOSEPH GRIFFIN, *Author of "Chemical Recreations."**

Analysis of Chlorides.

METHOD.

- a. **WEIGH** the chlorides.
- b. Dissolve the chlorides, precipitate with nitrate of silver, and weigh the chloride of silver.
- c. Multiply the weight of the mixed alkaline chlorides *a*, by 1·92404.
- d. Subtract the product of the multiplication *c*, from the weight of the chloride of silver *b*.
- e. Divide the residue of the subtraction *d*, by 0·52201.
- f. The product of the division *e*, is the weight of the chloride of sodium contained in the mixture *a*.
- g. The difference between the weight of the mixed chlorides *a*, and that of the chloride of sodium *f*, is the weight of the chloride of potassium.

Explanation.—The quantity of chloride of silver producible by chloride of sodium *above* the quantity producible by chloride of potassium, is 0·52201 for every unit of the given chloride of sodium. For,

1 of chloride of sodium produces of chloride of silver	}	2·44605
1 of chloride of potassium produces of chloride of silver		1·92404

The excess being = 0·52201

Consequently, in *any quantity* of chloride of silver produced by a mixture of chloride of sodium and chloride of potassium, we have

First, as much chloride of silver as is producible by a quantity of chloride of potassium of equal weight to the given mixture of chlorides; and

Secondly, as much more chloride of silver as is equal to

* Communicated by the Author: a paper on indirect chemical analysis, by Dr. G. Bird, will be found in vol. xii. p. 229.

the quantity producible by chloride of sodium above the quantity producible by chloride of potassium; this additional quantity of chloride of silver being equal to 0.52201 multiplied by every unit of chloride of sodium present in the mixture.

Wherefore,

In Operation c, we multiply the mixed chlorides by 1.92404 to find the quantity of chloride of silver producible by the given weight of chloride of potassium alone.

In Operation d, we subtract this quantity from that of the chloride of silver actually produced in experiment *b*, by the mixed alkaline chlorides; and thus determine the amount of the excess produced by the chloride of sodium.

In Operation e, we divide this excess by 0.52201 to ascertain the number of units, or the weight, of the chloride of sodium contained in the mixture.

Tables of Data.—1. To find the weight of the components and equivalents of any quantity of chloride of sodium, multiply it,

by 0.39656 for the sodium it contains.

0.60344 for the chlorine.

0.53289 for its equivalent of soda.

And by 2.44605 for the quantity of chloride of silver which it produces by precipitation.

2. To find the weight of the components and equivalents of any quantity of chloride of potassium, multiply it

by 0.52534 for the potassium it contains.

0.47466 for the chlorine.

0.63257 for its equivalent of potash.

And by 1.92404 for the quantity of chloride of silver which it produces by precipitation.

These tables explain the reason why a greater quantity of chloride of silver is produced by chloride of sodium than by chloride of potassium. The reason is that chloride of sodium contains 60 per cent. of chlorine, while chloride of potassium contains little beyond 47 per cent. I point out this fact, because it shows *the sort of differences upon which all indirect analyses must be founded.*

Example.—In the analysis of a mineral that contains both potassium and sodium we have proceeded so far as to have nothing to separate but these two metals, which are present in the condition of chlorides.

a. The mixture of chlorides weighs 5 grains.

b. It produces by precipitation 11.18623 grains of chloride of silver.

134 *Analysis of mixed Salts of Potassium and Sodium.*

- c. The weight of the mixture *a*, 5 grains, multiplied by 1·92404 gives 9·62020.
- d. 9·62020 subtracted from 11·18623 gives 1·56603.
- e. 1·56603 divided by 0·52201 gives 3.
- f. The weight of the chloride of sodium in the mixture *a* is 3 grains.
- g. The weight of the chloride of potassium is 2 grains.
 The quantity of sodium equivalent to the chloride of sodium is $3 \times 0\cdot39656$
 The quantity of soda is $3 \times 0\cdot53289$
 The quantity of potassium equivalent to the chloride of potassium is $2 \times 0\cdot52534$
 The quantity of potash is $2 \times 0\cdot63257$

Analysis of Sulphates.

METHOD.

- a. Weigh the mixed sulphates.
- b. Dissolve the sulphates, precipitate with chloride of barium, and weigh the sulphate of barytes.
- c. Multiply the weight of the mixed alkaline sulphates *a*, by 1·33633.
- d. Subtract the product of the multiplication *c* from the weight of the sulphate of barytes *b*.
- e. Divide the residue of the subtraction *d* by 0·29814.
- f. The product of the division *e* is the weight of the sulphate of soda contained in the mixture *a*.
- g. The difference between the weight of the mixed sulphates *a*, and that of the sulphate of soda *f*, is the weight of the sulphate of potash.

Explanation.—The quantity of sulphate of barytes producible by sulphate of soda *above* the quantity producible by sulphate of potash, is 0·29814 for every unit of the given sulphate of soda. For

1 of sulphate of soda produces of sulphate of barytes 1·63447
 1 of sulphate of potash produces of sulphate of barytes 1·33633

The excess being = 0·29814

The further explanation of this method is the same as the explanation of the analysis of the alkaline chlorides.

Tables of Data.

1. To find the weight of the components and equivalents of any quantity of sulphate of soda, multiply it by
 0·326095 for the sodium it contains.
 0·673905 for the sulphur and oxygen.
 0·43819 for the soda.
 0·56181 for the sulphuric acid.

And by 1·63447 for the quantity of sulphate of barytes which it produces by precipitation.

2. To find the weight of the components and equivalents of any quantity of sulphate of potash, multiply it

by 0·449019 for the potassium it contains.

0·550981 for the sulphur and oxygen.

0·54067 for the potash.

0·45933 for the sulphuric acid.

And by 1·33633 for the quantity of sulphate of barytes which it produces by precipitation.

Example.—In the analysis of a sample of commercial alum, we have proceeded so far as to have nothing to separate but sulphate of potash from sulphate of soda, both of which alkalies have been detected by previous testing.

a. The mixture of sulphates weighs 7 grains.

b. It produces by precipitation 10·54687 grains of sulphate of barytes.

c. The weight of the mixture *a*, 7 grains, multiplied by 1·33633 gives 9·35431.

d. 9·35431 subtracted from 10·54687 gives 1·19256.

e. 1·19256 divided by 0·29814 gives 4.

f. The weight of the sulphate of soda in the mixture *a* is 4 grains.

g. The weight of the sulphate of potash is 3 grains.

The quantity of sodium equivalent to the sulphate of soda, is $4 \times 0·326095$

The equivalent of soda, is $4 \times 0·43819$

The quantity of potassium equivalent to the sulphate of potash, is $3 \times 0·449019$

The equivalent of potash, is $3 \times 0·54067$

The atomic weights employed in these calculations are those of Berzelius.

Glasgow, March 19, 1838.

XIX. *On some of the Phenomena and Laws of Action of Voltaic Electricity, and on the Construction of Voltaic Batteries, &c.* By CHRISTOPHER BINKS. *A second Communication, addressed to J. F. Daniell, Esq. F.R.S., &c., Professor of Chemistry in King's College, London. Part the Second.*

[Continued from Part i. p. 75.]

Section IV.

73. **T**HE ultimate object of the following experiments is to determine on the most advantageous construction of the voltaic battery; that is, such a construction as shall com-