

ON THE NEW METAL ACTINIUM.

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Since the publication of my two notes in the *Chemical News*, vol. xliii, p. 283 and vol. xlv, p. 73, I have made a great number of experiments with the view of isolating the new substance to which the white zinc pigment owes its remarkable property of darkening in the sunlight, returning to its white state in the dark, and not being affected in this manner under a sheet of glass.

These experiments have at last proved successful, and a very short note to that effect was communicated, about a fortnight ago, to the Académie des Sciences and another to the British Association on Monday, September 5th. I will now describe the process by which I have isolated the oxide and the sulphide of the new metal in a state of tolerable purity. Perhaps this process may be improved hereafter, but it is not very complicated, though it has required an enormous number of experiments to arrive at it. First, one word as to the manner in which the pigment found in commerce is prepared. Ordinary zinc scrap is dissolved in sulphuric acid and a considerable excess of zinc is left in the solution in order to keep out iron, lead, arsenic and other metals. The liquid is drawn off and then precipitated by a solution of sulphide of barium; the precipitate is dried, calcined, raked whilst hot into cold water, dried again, ground, etc. It then consists of sulphide of zinc, oxide of zinc and sulphate of baryta, with *minute* quantities of iron, lead, arsenic, manganese, etc.

The manner in which I have obtained the oxide and sulphide of actinium from this pigment is as follows, and the process will doubtless serve for the treatment of other substances in which the presence of the new metal may be detected:

About 15 grammes of the finely pulverized pigment are left for 24 hours in dilute acetic acid (strongest acetic acid and water equal parts), and the mixture well stirred or shaken occasionally. This takes out most of the iron, manganese, magnesia, lime and *oxide* of zinc. The residue, after being washed, is treated exactly in the same manner with dilute hydrochloric acid (acid 8 parts, water 92 parts), with the

object of completing the action of the acetic acid. The residue, well washed, is then heated with strong hydrochloric acid, to which a little nitric acid is added from time to time. The solution of the chlorides thus obtained is filtered to separate free sulphur and the insoluble sulphate of baryta, any remaining sulphur in suspension after filtration being oxidized by a few crystals of chlorate of potash. To this solution of chlorides, somewhat diluted, a considerable excess of caustic soda is added and the solution heated. The zinc oxide goes into solution and the white oxide of actinium remains; the latter is received upon a filter, washed, dissolved in hydrochloric acid and the solution again treated with excess of caustic soda. (These operations may be repeated two or three times, in order to eliminate the zinc oxide as completely as possible.) Finally, the oxide of actinium, still impure, is washed on a filter and dissolved in a considerable excess of hydrochloric acid. The solution is neutralized by ammonia, and then the latter is added in excess. All but a little iron oxide remains dissolved (if not, dissolve again in HCl and add ammonia in excess, which, this time, will only precipitate the iron). The iron oxide is separated by the filter, and to the filtrate sulphide of ammonium is added, which throws down the sulphide of actinium as a bulky pale canary-yellow precipitate, the color of which is best seen when it is received on a filter.

Oxide of Actinium.—The hydrate as precipitated by soda or ammonia forms a bulky white precipitate, more gelatinous than oxide of zinc; unlike the latter, it is only very slightly soluble in caustic soda, even when the liquid is heated; it is not precipitated by ammonia from solutions containing ammoniacal salts. It is a permanent white, with a slight tinge of salmon color when seen in bulk, and it does not change color when exposed to the air, as oxide of manganese does, neither does it appear to be affected by the direct rays of the sun. It is readily soluble in acids. The anhydrous oxide is not volatile nor decomposed by heat. It has a pale fawn-colored tint.

Sulphide of Actinium.—The hydrate as precipitated from its neutral or alkaline solutions by sulphide of ammonium is a bulky pale canary-yellow precipitate, insoluble in excess of sulphide of ammonium, scarcely at all soluble in acetic acid, readily soluble in mineral acids even when they are diluted. When exposed to the direct rays of the sun it darkens and becomes quite black in about twenty min-

utes, except in those places where it is protected by a piece of ordinary window glass.

The quantity of actinium sulphide obtained from the white pigment amounts to no less than about 4 per cent. This yield is enormous. The presence of this new element in zinc will account, probably, for the discrepancies noticed in the *equivalent* of this metal as determined by various observers. The new element differs very essentially from manganese, zinc and cadmium, but has, perhaps, some points of similarity with lanthanum. It exists, evidently, in considerable quantities in at least some kinds of commercial zinc. As soon as I shall have written the next number of my *Journal of Medicine*, I intend to pursue these investigations.—*Chemical News*.

Athermanous Photometer.—The industrial progress of electric light increases the desirability of a good photometer, which is easily transportable and does not require delicate manipulations. Unfortunately, all the instruments which have hitherto been invented have the grave defect of being influenced both by light and heat. Raimond Coulon proposes an apparatus which is acted upon by light alone. It is based upon the following principles: 1. In a Crookes' radiometer, if a difference of temperature is produced upon any point of the surface of the glass envelope the wheel ceases to turn, under the influence of light, as long as this difference continues. There is a fixed relation between the value of the angle which one of the palettes makes with the heated or cooled point, the intensity of the luminous ray, and the calorific difference between the disturbed point and the rest of the envelope. 2. The luminous conditions remaining constant, every radiometer of which the temperature is raised turns in such a manner that the bright side of the mica palette seems to be attracted by the envelope. Every radiometer of which the temperature is lowered turns in an opposite direction; every radiometer of which the temperature is constant remains immovable, so long as it is in obscurity. 4. Every radiometer of a constant temperature turns under the influence of light alone. The inventor soon found that it was necessary to maintain the instrument at a temperature superior to that which is produced by the radiant heat of the luminous sources which are to be measured. Practically, the temperature of boiling water is convenient and sufficient.—*La Lumière Electrique*. C.