

- IV. "Account of a Meteor that fell on the 'Seven Stones' Light-ship," in a Letter from the Secretary to the Corporation of the Trinity House, addressed to the PRESIDENT. Received January 9, 1873.

Trinity House, London, E.C., 9th January, 1873.

SIR,—I am directed to acquaint you that on the 13th of November last, at 2 A.M., a meteor burst against the 'Seven Stones' light-vessel belonging to this Corporation, and moored about $9\frac{1}{2}$ miles E. by N. of the Scilly Islands; and that it has been reported that the watch were struck senseless for a short period, seeing nothing before the shock, but that, on recovery, balls of fire like large stars were falling in the water like splendid fireworks, and that the decks were covered with cinders, which crushed under the sailors' feet as they walked. It appeared, the men said, as if something was passing swiftly and met with the obstruction of the vessel and burst.

The superintendent reports that the men say there was a very decided smell of brimstone, but add that they did not mention that until he asked them. There is reason to fear that the cinders were all washed off the decks by the rain and sea before daylight; and it happened also unfortunately that the men did not think to observe the compasses.

The Elder Brethren have great doubts whether any more accurate account of the phenomenon than the foregoing is obtainable; at the same time they direct me to report the matter to you, conjoined with the assurance that if any important or interesting scientific question is likely to be elucidated by further inquiry, they will have great pleasure in causing special questions to be put to the men, or in affording any member of the Royal Society facilities for investigation.

I am, Sir,

Your most humble Servant,

Sir G. B. Airy, K.C.B., &c. &c.

ROBIN ALLEN, *Secretary*.

January 23, 1873.

T. ARCHER HIRST, Ph.D., Vice-President, in the Chair.

The following communications were read:—

- I. "Contributions to the History of the Orcins.—No. III. Amido-derivatives of Orcin"*. By JOHN STENHOUSE, LL.D., F.R.S., &c. Received November 7, 1872.

In a paper published in March 1871†, I stated that I had made some experiments on the action of reducing agents on trinitro-orcinic acid and

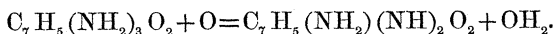
* A preliminary note on this subject appeared in the 'Chemical News,' vol. xxiii. p. 292, and Zeits. Chem. vol. vii. p. 414.

† Proc. Roy. Soc. vol. xix. p. 410.

trinitro-resorcinic acid; but as Dr. Schreder* has since published an account of some of the amido-derivatives of the latter substance, I have not pursued my investigations further in that direction, but confined myself to an examination of the products obtained from trinitro-orcinic acid.

Amido-diimido-orcin, $C_7H_5(NH_2)(NH)_2O_2$.—This compound, which has the properties of a base, is formed by the oxidation of triamido-orcin, and is most conveniently obtained in a pure state by decomposing a solution of the acetate with a slight excess of ammonia.

The most advantageous method of preparing the base is to reduce trinitro-orcin with sodium-amalgam, and to oxidize the alkaline solution of triamido-orcin by exposure to the air. The details of the process are as follows:—One part of trinitro-orcin and forty or fifty parts of water are placed in a bottle furnished with a caoutchouc cork, and fragments of sodium-amalgam containing about 3 per cent. of sodium are gradually introduced and agitated with the solution, which first acquires a brown colour from the formation of an intermediate amido-product, probably analogous to picramic acid, but becomes colourless as soon as the trinitro-orcin is completely reduced. The solution should be cooled from time to time, as considerable heat is generated during the reaction. When the solution containing triamido-orcin and sodic hydrate has become cold, it is poured into a large flask and agitated briskly; by this means the triamido-orcin is oxidized to amido-diimido-orcin and the solution assumes a magnificent blue colour:



A few seconds' agitation is sufficient, as if it be continued after the blue colour is fully developed, the amido-diimido-orcin in the strongly alkaline solution undergoes further oxidation and is destroyed. On strongly acidulating the blue solution with sulphuric or hydrochloric acid, the corresponding salt of amido-diimido-orcin is precipitated. Instead of directly agitating the colourless solution with air, it may be first neutralized or rendered very slightly acid with hydrochloric acid, cooled, and then rendered alkaline with ammonia. If this solution be now agitated in the manner before described it becomes filled with minute green needles of amido-diimido-orcin. Although the first method gives the best results when carefully conducted, it requires considerable experience to stop the oxidation at the precise point when the whole of the triamido-orcin is oxidized to amido-diimido-orcin, and before the latter becomes destroyed. With the ammoniacal solution there is far less danger of over oxidation.

Trinitro-orcin is also reduced by treatment with tin and hydrochloric acid, or zinc and hydrochloric or sulphuric acid. One part of trinitro-orcin and four parts of granulated tin are heated in a capacious flask with eight measures of concentrated hydrochloric acid diluted with sixteen measures of water. In a short time a powerful reaction takes

* Ann. Chem. Pharm. vol. clviii. p. 244.

place, so that it is advisable to remove the flask from the source of heat in order to prevent the contents from boiling over. When the action has become somewhat moderate, the solution is boiled until it is colourless, then diluted with water and the tin precipitated by hydrosulphuric acid. The clear solution acquires a purple tint on standing, and deposits large dark-coloured prisms of amido-diimido-orcin hydrochlorate, or the amido-diimido-orcin may be obtained directly by adding a slight excess of ammonia to the filtrate from the tin sulphide and oxidizing by agitation in the presence of air, when the base immediately separates in minute green needles. Trinitro-orcin and granulated zinc are boiled in a flask with twenty or thirty parts of water, and hydrochloric acid added in small quantities at a time until the solution becomes almost colourless. The clear liquid, poured from the excess of zinc and allowed to cool, is rendered slightly alkaline by ammonia and exposed to the air. As soon as the triamido-orcin is oxidized, which may be known by the brown colour of the product, an excess of hydrochloric acid is added to dissolve the zinc oxide and precipitate the amido-diimido-orcin as hydrochloride. The yield is, however, considerably less than when sodium-amalgam is employed as the reducing agent.

The amido-diimido-orcin sulphate or hydrochlorate obtained by any of the above processes is readily decomposed by treatment with a slight excess of dilute ammonia, leaving the free base in an impure state. This should then be dissolved in warm dilute acetic acid, filtered, and precipitated by a slight excess of ammonia. Two or three solutions and reprecipitations are sufficient to render it pure.

Pure amido-diimido-orcin crystallizes in small needles, which have a dark green metallic lustre by reflected light. They are insoluble in alcohol, ether, and benzol, and almost insoluble in water and dilute ammonia. Strong ammonia only dissolves the base in small quantity, yielding a pale blue solution, but it is readily soluble in a solution of sodic hydrate, with a fine deep blue colour; the solution, however, when boiled, loses its colour, ammonia being at the same time evolved. The base gives off ammonia when heated, and leaves a carbonaceous residue very difficult of combustion. As might be expected, when amido-diimido-orcin is treated with sodium-amalgam, it is reconverted into triamido-orcin.

Analysis of amido-diimido-orcin.—·290 grm. substance, dried *in vacuo*, lost ·025 grm. when dried at 100°, equivalent to 8·62 per cent.

I. ·140 grm. substance, dried at 100°, gave ·234 grm. carbonic anhydride and ·075 grm. water.

II. ·290 grm. substance, dried at 100°, gave ·487 grm. carbonic anhydride and ·152 grm. water.

		Theory.	I.	II.	Mean.
C ₇	= 84	= 45·40	45·59	45·77	45·68
H ₁₁	= 11	= 5·95	5·95	5·81	5·88
N ₃	= 42	= 22·70
O ₃	= 48	= 25·95
	185	100·00			

It will be seen that the results of the analyses agree with the formula $C_6(CH_3)(NH_2)(NH)_2(OH)_2 + H_2O$ for the substance dried at 100° , and the formula for the substance dried *in vacuo* is probably



as it requires 8·87 per cent. water.

Triamido-orcin.—The colourless solution obtained by the reduction of trinitro-orcin with tin and hydrochloric acid, after removal of the tin by sulphydric acid, appears to contain triamido-orcin hydrochloride along with excess of hydrochloric acid. On concentrating the solution at 100° much of the triamido-orcin is decomposed and a considerable amount of ammonium chloride formed; whilst, although long needles of triamido-orcin hydrochloride are obtained by evaporating it in a vacuum, yet, owing to their great solubility and the readiness with which they absorb water and deliquesce, the salt has not yet been obtained in a state fit for analysis. On moistening the crystals of this hydrochloride with ammonia, they become almost instantaneously converted into the metallic green needles of the amido-diimido-orcin.

If a current of sulphuretted hydrogen be passed through a solution of ammonium sulphhydrate in which amido-diimido-orcin is suspended, the latter rapidly loses its colour and becomes converted into a sandy deposit consisting of colourless crystals. These are apparently triamido-orcin, and may be washed by decantation with a dilute solution of ammonium sulphhydrate, in which they are but slightly soluble. These crystals rapidly acquire the metallic green lustre of amido-diimido-orcin when exposed to the air, and are readily soluble in dilute acids. The hydrochloric-acid solution behaves in a manner precisely similar to that obtained by the reduction of trinitro-orcin with tin and hydrochloric acid, becoming deep red, and depositing crystals of amido-diimido-orcin hydrochloride when exposed to the air.

Amido-diimido-orcin hydrochloride.—The hydrochloride obtained in the preparation of amido-diimido-orcin, as described in the earlier part of this communication, may be purified by crystallization from hot water; but as heat decomposes solutions of the salts of this base, it is better to precipitate a cold solution of the acetate by a slight excess of hydrochloric acid, in which the hydrochloride is but slightly soluble: the precipitate should be thoroughly washed with alcohol, pressed, and dried.

Pure amido-diimido-orcin hydrochloride crystallizes in different ways, according to the circumstances under which the crystals are formed. As

produced directly by adding hydrochloric acid to the blue solution of the base in caustic soda obtained from trinitro-orcin by sodium-amalgam, it forms long silky needles of a brownish-red colour: an aqueous solution of the acetate or hydrochloride precipitated by an excess of hydrochloric acid yields a mixture of these needles with rhomboidal plates; the latter are purple by reflected light, and of an olive-green colour by transmitted light. The slow oxidation of the hydrochloric-acid solution of triamido-orcin obtained by means of tin and hydrochloric acid yields dark-coloured short thick prisms. The hydrochloride is insoluble in alcohol and ether, moderately soluble in cold water, and readily in boiling water, although the latter causes partial decomposition. Its aqueous solution is precipitated almost entirely on acidulating it with hydrochloric acid; but the salt is soluble in concentrated hydrochloric acid, especially when warm, forming a purple solution. On boiling this the salt is rapidly decomposed and the colour changes to a dirty green.

Analysis of amido-diimido-orcin hydrochloride.—428 grm. substance, dried *in vacuo*, lost .035 grm. when heated to 100°, corresponding to 8.41 per cent. water.

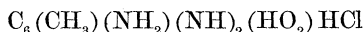
I. .255 grm. substance, dried at 100°, gave .180 grm. argentic chloride.

II. .232 grm. substance, dried at 100°, gave .164 grm. argentic chloride.

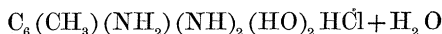
III. .344 grm. substance, dried at 100°, gave .242 grm. argentic chloride.

	Theory.	I.	II.	III.	Mean.
$C_7H_{10}N_3O_2 =$	168	82.55			
$Cl =$	35.5	17.45	17.47	17.49	17.40
	203.5	100.00			17.45

These results correspond nearly to the formula



for the substance dried at 100°; and the formula



requires 8.13 per cent. water, and would therefore appear to be that of the substance dried *in vacuo*.

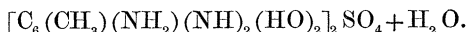
Amido-diimido-orcin sulphate.—This salt is readily prepared by precipitating a dilute solution of the acetate with sulphuric acid, when it forms minute lustrous plates which are purple by reflected light. By slow crystallization from a hot aqueous solution it may be obtained in large leaf-like plates. It somewhat resembles the hydrochloride in its properties, but is much less soluble in water.

Analysis of amido-diimido-orcin sulphate.—I. .255 grm. substance, dried at 100°, gave .128 grm. barium sulphate.

II. .284 grm. substance, dried at 100°, gave .143 grm. barium sulphate.

	Theory.	I.	II.	Mean.
$(C_7H_{12}N_3O_3)_2 = 372$	79.49
$SO_4 = 96$	20.51	20.65	20.72	20.69
	<hr/> 468	<hr/> 100.00		

The formula of this salt would therefore appear to be



Amido-diimido-orcin nitrate is prepared, like the sulphate, by adding a slight excess of nitric acid to a moderately strong solution of the acetate and washing the precipitate with alcohol. It closely resembles the sulphate in appearance, but is much more soluble in water. When heated with excess of nitric acid it is decomposed, yielding a yellow solution, which, on being evaporated, leaves a mixture of oxalic acid and an amorphous yellow substance.

Amido-diimido-orcin acetate.—Amido-diimido-orcin dissolves readily in acetic acid; and on carefully evaporating the solution at a low temperature, the acetate is obtained in ill-defined crystalline plates having a purple iridescence. It is readily soluble in cold water, but only slightly soluble in glacial acetic acid.

Amido-diimido-orcin oxalate.—Very slightly soluble purple scales obtained by precipitating a solution of the acetate with oxalic acid.

Amido-diimido-orcin picrate.—On adding a solution of picric acid to a dilute solution of amido-diimido-orcin acetate and washing the precipitate with alcohol, the picrate is obtained in iridescent green needles and plates. It is insoluble in alcohol, and but slightly soluble in water.

I cannot conclude this paper without acknowledging the very efficient aid I have received from my assistant, Mr. Charles Edward Groves, in conducting this investigation.

II. "Note on the Wide-slit Method of viewing the Solar Prominences." By WILLIAM HUGGINS, D.C.L., LL.D., F.R.S. Received November 21, 1872.

When editing the English translation of Schellen's 'Spectrum Analysis,' I discovered that the short account of the method of viewing the forms of the solar prominences by means of a wide slit, which I had the honour of presenting to the Royal Society on February 16, 1869*, does not agree exactly in one respect with the account of the observation of February 13 as it was entered at the time in my observatory book. The short note was written at the suggestion of a friend during a Committee held in the Royal Society's Apartments, and, as the concluding words show, was intended to be followed by a more detailed account of the method of observation. The point in question relates to the position of a second slit which was used to screen the eye from every part of the

* Proc. Roy. Soc. vol. xvii. p. 302.