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LIII.-On Chlor-stannic Acid.

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A BOTTLE containing a pretty strong aqueous solution of stannous ride, which had stood upon the laboratory shelves for a year or two, occasionally opened, and never very tightly closed, had for some time been growing turbid, though no great quantity of the white insoluble stannous oxychloride had been produced. I observed lately that a soft solid layer of nearly transparent jelly-like material had formed at the bottom to the depth of about a centimeter. This colloid substance, of yellowish colour, was obtained in a nearly pure state by carefully decanting off the liquid from above it, lightly rinsing it in the undisturbed condition, and then, after breaking it up, with a little water, and finally removing it from the bottle to a glass plate, upon which it was allowed to dry at atmospheric temperature.

The small amount of washing to which most of the material was subjected seemed to produce no change upon it, but long continued treatment with water, particularly if hot, produced whitish turbidity, and obviously altered the chemical composition.

The substance, which while moist reddened litmus-paper, shrank greatly in bulk on drying, cracked asunder, and assumed the appearance of little fragments of pale-yellow gum arabic. When heated in a glass tube it gave off hydrochloric acid with a very little vapour of water, and left behind a white residue of stannic oxide free from chlorine, just the same result being observed when free oxygen was excluded, the tube being first exhausted of air by the Sprengel pump. The supply of material was but meagre; it sufficed, however, for obtaining the following quantitative results:

 \cdot 7253 gram gave off \cdot 1396 gram of HCl and \cdot 0092 gram of H₂O, and left behind \cdot 5804 gram of SnO₂.

Assuming that the triffing quantity of water may be neglected, as resulting merely from imperfect drying, these figures correspond with the formula SnO_2HCl .

	Found.	Calculated.
${\rm SnO}_2$	$\cdot 5804$	$\cdot 5804$
HCl	$\cdot 1396$	$\cdot 1412$

and hence the constitutional formula may be inferred to be-

$$0 = Sn <_{OH}^{Cl}$$

or that of normal stannic acid with one hydroxyl replaced by chlorine, a true chlorine substitution-product from a metallic acid, analogous in structure to the chloro-hydrated sulphuric acid of Williamson (*Proc. Roy. Soc.*, 7, 11)—



In order to test the possession of acid character, a solution of caustic soda was brought in contact with this substance, both in its fresh still moist condition and after drying. In both cases decomposition took place, sodium chloride being formed, and a white opaque powder produced, slowly dissolving in excess of the liquid. By using very weak solution of ammonia, however, no material change of appearance was produced; a little of the gummy mass dissolved, but most remained behind, and on drying this latter portion in the air after prolonged contact with the solution, heating the colloid material with a fixed alkali in a glass tube expelled gaseous ammonia.

·4409 gram heated with solid sodium hydrate gave off ·0395 gram of NH_3 —the formula—

$$0 = Sn <_{O-NH_4}^{Cl}$$

requires '0368 gram, tending to confirm the above view of the character of this substance.

The change experienced by the original stannous chloride may be supposed to have been—

$$\operatorname{SnCl}_2 + \operatorname{H}_2O + O = \operatorname{HCl} + \operatorname{SnO} \left\{ \begin{array}{c} \operatorname{Cl} \\ \operatorname{OH} \end{array} \right\}$$

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or else the usual formation of stannous oxychloride and stannic chloride from absorption of oxygen,

$$3$$
SnCl₂ + O = Sn₂Cl₂O + SnCl₄

may have first occurred, followed by the reaction-

$$\operatorname{SnCl}_{4} + 2\operatorname{H}_{2}\operatorname{O} = 3\operatorname{HCl} + \operatorname{SnO}\left\{ \begin{array}{c} \operatorname{Cl} \\ \operatorname{OH} \end{array} \right\}$$

I have made several attempts in various ways to reproduce these results, but so far without success.

At the risk of a little confusion growing out of the name chlorostannates having been used for the double chlorides of tin and other metals, but as far as possible avoiding this by a slight change in the form of the prefix, the substance now described may properly be called chlor-stannic acid.