

cannot be formed by the decomposition of tannic acid. For that purpose, Strecker's formula must be raised to at least 60 atoms carbon, when, of course, after the deduction of the gallic acid with 42 atoms of carbon, a hydrate of carbon,  $C^{18} H^3 O^3$ , would remain over—



This last might be changed into sugar in the ebullition with sulphuric acid, which is not at all improbable, as from the reactions of the tannic and allied acids, sugar can scarcely pre-exist in them. As soon as we have analysed the residue of the preparation of tannigenamic acid, as well as the substance formed from this acid by the action of concentrated sulphuric acid, and the gallate of ammonia, we propose to return upon this point.

Lastly, with regard to the name provisionally adopted by us for our new acid, tannigenamic acid, the acid, certainly, in reference to the connexion between the hitherto-known amidogen acids and their ammoniacal salts, is not to be characterized as an amidogen acid, because the number of atoms of water eliminated do not correspond with the number of atoms of ammonia. Should it however appear that the acid produced from it by concentrated sulphuric acid is really unaltered, and not an acid differing from it in the number of equivalents of water, this name, which expresses its derivation and production from ammonia, may appear not inappropriate.—*Chem. Pharm. Cent. Blatt*, xxiii. 417.

## ANALYTICAL CHEMISTRY.

*New Method of precipitating Oxide of Tin and separating it from other Bodies, and of combining it with Silk, Woollen and Cotton Fabrics.* By J. LÖWENTHAL.

WHILE endeavouring to find a simple and accurate means of detecting small quantities of perchloride of tin in protochloride, the author found that alkaline sulphates possess the property of decomposing the perchloride and precipitating hydrated oxide from the aqueous solution, while they do not exercise the slightest influence upon the protochloride when atmospheric air is excluded.

In order to prove that it was the alkaline sulphate and not the water dissolving it which effected the decomposition, Löwenthal made the following experiments.

A gramme of anhydrous perchloride of tin was treated in two experiments with 100 and 60 cubic cent. of cold water. The one solution began to lose its clearness after 2 or 3 hours, the latter not till after 36 hours, then very feebly, and it was not milky until after a week. Having thus ascertained the proportion of water which might be employed without fearing decomposition, he mixed,—

a. 0.5 gm. perchloride with a solution of 1 gm. crystallized

sulphate of soda in 30 cub. cent. water at 64° F. A precipitate was immediately formed.

*b.* The experiment *a.* was altered by adding 0.125 grm. hydrochloric acid, 1.12 sp. gr., to the perchloride of tin. The liquid was at first turbid, and after one minute the decomposition was complete.

*c.* On using 0.25 grm. hydrochloric acid, it was not complete until after 3 minutes, with 0.375 grm. 10 min., with 0.5 grm. 43 min., and with 0.75 grm. of acid the liquid remained clear for several hours.

*d.* 0.5 grm. perchloride with 0.5 grm. hydrochloric acid and 30 cub. cent. water containing 2.5 grms. crystallized sulphate of soda, were mixed at 64° F.: remained at first clear, and the decomposition was not completed until after 7 minutes.

*e.* The experiment *c.* with 0.5 grm. acid repeated. The liquid at first clear, immediately gave a precipitate when heated to about 108° F.

*f.* 0.5 grm. protochloride treated with only 15 grms. water containing 1 grm. sulphate of soda. Liquid at first clear, gave a precipitate when heated which did not disappear on cooling.

*g.* Metastannic acid long digested with hydrochloric acid and the residue dissolved in water. On the addition of sulphate of soda the decomposition ensued immediately. It follows from these data that,—

1. The decomposition takes place in the cold only when a certain quantity of water is present.

2. In the absence of free acid, with an adequate quantity of water and with about 2 equivs. sulphate of soda to 1 equiv. perchloride of tin, the decomposition takes place immediately.

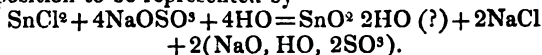
3. Free acid hinders the decomposition more or less in proportion to its quantity. Its influence may be removed by the careful addition of ammonia. Chloride of ammonium does not cause the decomposition of the perchloride.

4. With equal quantities of free acid the decomposition takes place more rapidly, the greater the quantity of sulphate of soda.

5. Heat favours the decomposition in all cases.

Löwenthal likewise found that the sulphates of magnesia, alumina, protoxide of manganese, iron, zinc and copper, peroxide of iron, produced the same decomposition; moreover, nitrates of soda, ammonia, baryta, zinc and copper.

He found that the precipitate was pure hydrated oxide of tin, and never contained any of the acid of the precipitant. He regards the decomposition to be represented by



Although in this equation 4 equivs. sulphate of soda are given, the decomposition takes place with 2 and even with 1 equiv., but a larger quantity of water is then necessary. In this case acid is set free; however, with a sufficiency of water this does not permanently hinder the decomposition (in which the tendency of the hydrated oxide of tin to separate certainly plays an important part), especially at an elevated temperature. The influence of this latter condition was indeed to be expected, since Fremy has shown that the solution of

hydrated oxide of tin in dilute sulphuric acid is decomposed by boiling.

It now remained to prove that by this means all the tin present as perchloride was precipitated, and that the separation of the tin and chlorine was complete. The decomposition was effected with sulphate of soda (A) and nitrate of ammonia (B). 100 parts of a solution of perchloride of tin gave the following results :—

A.			B.		
	Tin.	Chlorine.		Tin.	Chlorine.
1.	4·964	5·976	1.	4·935	5·962
2.	4·975	5·956	2.	4·948	5·971

Consequently 100 parts anhydrous perchloride of tin would contain—

Calculated.		Found.			
		A.		B.	
		1.	2.	1.	2.
Sn eqt. wt. . . . .	45·30	45·37	45·51	45·38	45·32
2Cl eqt. wt. . . . .	54·70	54·63	54·49	54·62	54·68
	100·00	100·00	100·00	100·00	100·00

These results show that the separation is effected with great accuracy.

This behaviour of oxide of tin admits of several useful applications ; among others—

1. The detection of tin in almost any liquid.
2. It affords an exact and simple means of quantitatively determining tin, as well as an easy and perfect means of separating it from chlorine and other halogens, from alkalies, &c.

It is of especial worth to manufacturers in determining the commercial value of tin salts. In the absence of delicate balances they generally have recourse to the nitric acid test, which always gives an incorrect result, in consequence of the volatilization of the chloride of tin.

In some experiments on the quantitative separation of oxide from binoxide of tin, I obtained on mixing 9·0723 of the above solution to which a few drops of hydrochloric acid had been added with 10·6196 of a solution of protochloride corresponding to 16 per cent. of protoxide, 0·6792 protoxide of tin corresponding to 0·5339 grm., or calculated for 100 parts of the solution 5·002, consequently only 0·042 per cent. more than the average of the above results, which amounts to 4·960.

3. It affords a very suitable means of combining oxide of tin with cotton, woollen and silk stuffs in dyeing. Löwenstein considers that the experiments made by him justify the opinion that this method, *properly employed*\*, has great advantages over the use of the expensive alkaline stannates.

4. Dark colours containing tin may be conveniently made by this means.—*Journ. für Prakt. Chem.* lvi. p. 366.

\* The mode of employment is not stated by the author.