hydrogen is set free and nearly, or quite, the full equivalent of the metal appears in the amount of reduced acid. It would seem, therefore, since the temperature is practically the same in all cases, as well as the concentration of the acid, that the reduction cannot be accounted for on the basis of nascent hydrogen. In each case it seems to be rather a mere question of the tendency of the metal, under the conditions, to oxidize at the expense of the oxygen of the acid, or, to go into solution at the expense of the hydrogen which is set free. In the cases of iron, tin and bismuth it seems evident to the eye that oxides are first formed, and in all cases where reduction occurs the view is simplest and most nearly in accord with the facts, that the metal is oxidized and that the oxide dissolves in the excess of the acid or remains insoluble, as in the case of bismuth.

Work is now in progress on the action of chloric acid on arsenic and it will be extended to other metals.

IOWA COLLEGE, GRINNELL, IOWA,
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SOME COMPOUNDS OF CHROMIC CHLORIDE WITH SUBSTITUTED AMMONIAS.

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IT HAS already been shown that dry liquid ammonia forms with violet chromic chloride a pink powder which, when extracted with water, gives crystalline compounds containing 12, 10 and 8 molecules of ammonia respectively.[1] In addition to this, compounds with methylamine were also obtained and described in a previous paper.[2] The authors have made a series of experiments with other substituted ammonias, the results of which are as follows:

(1) *Ethylamine*, $C_2H_5NH_2$, acts on the chloride with great energy at temperatures between 0° and 18°, producing a dark red powder. On extracting this compound with water and evaporating carefully, red crystals are obtained which, on analysis, give:

[1] Lang and Carson: This Journal, April, 1904, pp. 414-417.

[2] Lang and Jolliffe: *Ibid.*, p. 417.

	Per cent.
Chromium	12.97
Chlorine	26.38
Ethylamine	55.90
Water	4.75

corresponding thus to the formula $Cr_2Cl_6.10C_2H_5.NH_22H_2O$.

When the red powder is heated to 60° and again extracted with water, the solution yields crystals composed of

	Per cent.
Chromium	14.53
Chlorine	29.85
Ethylamine	50.40
Water	5.22

indicating the existence of the compound $Cr_2Cl_6.8C_2H_5.NH_22H_2O$.

(2) *Dimethylamine and Diethylamine* do not react with chromic chloride at any temperature between zero and their boiling-points If moisture be present, however, chromic hydroxide forms on standing for a few hours.

(3) *Trimethylamine and Triethylamine,* like the secondary amines, have no effect on chromic chloride.

(4) *Ethylene Diamine* reacts violently with the chloride at temperatures between zero and 18° with the evolution of a large amount of heat and the production of a dark red powder. This, when dissolved in water and evaporated in the air, yields dark red crystals having the composition:

	Per cent.
Chromium	12.43
Chlorine	12.40
Ethylene diamine	57.50
Water	4.67

The formula of this substance is thus $Cr_2Cl_6.8C_2H_4(NH_2)_2.2H_2O$.

(5) *Aniline, Methylaniline, and Dimethylaniline* do not have any action whatever on chromic chloride either at zero or at the boiling-points of the liquids, even when maintained in contact for a considerable time.

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