Note added in proof. If a mixture of purified isobutene and boron trifluoride, undergoing the very slow reaction in the gas phase at room temperature, is condensed in liquid air, it is found on warming up that all the isobutene has polymerized.

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[1] Evans, A. G., Holden, Plesch, Polanyi, Skinner and Weinberger, *Nature*, **157**, 102 (1946).

Composition of Cupric Ammino Nitrates

IN a recent publication[1] from this laboratory, we have described our results on the study of the composition of cupric ammino sulphates by the new electrical conductivity method[2] of Dey and Bhattacharya. In other communications we have described the isolation of cupric pentammino sulphate by alcoholic precipitation from ammoniacal solutions of cupric sulphate.

The new electrical conductivity method has now been applied to the study of the compositions of the cupric ammino nitrates and I shall here briefly report the results obtained. The method consists in the determination of electrical conductivities of a solution of cupric nitrate, of solutions of ammonium hydroxide of various concentrations and also of mixtures of cupric nitrate with different concentrations of ammonia. The conductivity of the mixture was observed to be higher than that of either constituent, and even greater than the sum of the conductivities of the constituents of the mixture. A graph was plotted with composition as the abscissæ and the percentage increase in conductivity as the ordinates. The curve gave several breaks corresponding to 3, 4, 5 and 6 molecules of NH_3 for a molecule of $Cu(NO_3)_2$, thus leading to the inference of the existence of tri-, tetra-, penta- and hex-ammino compounds of cupric nitrate.

The light absorption of mixtures of cupric nitrate with varying concentrations of ammonia were studied by a Nutting's spectrophotometer, and we obtained shifts in the regions of maximum absorption corresponding to mixtures of the compositions $Cu(NO_3)_2.4NH_3$, $Cu(NO_3)_2.5NH_3$ and $Cu(NO_3)_2.6NH_3$. We could not study the mixture with lower dilutions of ammonia as the solution becomes opaque due to hydrolysis.

Thus these results confirm the existence of the well-known tetra- and penta-ammino compounds of cupric nitrate. Horn[4] isolated a compound $4Cu(NO_3)_2.23NH_3$, which has been called the hexammino compound by some workers. It seems that Horn obtained the hexammino compound, but probably due to its unstability he could not determine the correct composition. My results also favour the existence of the hexammino compound. Further, the existence of the new triammino compound is undoubted, as shown by my electrical conductivity experiments.

I am indebted to Dr. A. K. Bhattacharya for his kind interest in this investigation.

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[1] Dey and Bhattacharya, *Curr. Sci.*, **14**, 69 (1945).
[2] Cf. Dey, *Curr. Sci.*, **15**, 24 (1946).
[3] Dey and Bhattacharya, *Curr. Sci.*, **14**, 201 (1945); *Proc. Ind. Acad. Sci.*, **23** A, in the press.
[4] Horn, *Amer. Chem. J.*, **37**, 620 (1907); **39**, 216 (1908).

Thorium Borate Sol and Gel

BERZELIUS[1] reported that boric acid precipitates white flocculent thorium borate when added to a solution of a salt of that element; the precipitate is insoluble in an excess of boric acid. Karl[2] discussed the composition of the amorphous white precipitate obtained by treating an aqueous solution of thorium nitrate with a hot solution of borax and showed that the composition corresponded with thorium orthoborate, $Th_3(BO_3)_4$. Guertler[3] could not prepare thorium borate by fusing thoria with boric oxide on account of the very sparing solubility of the thoria. A search of the literature revealed that no work is on record on the formation of the hydrosol and the hydrogel of thorium borate. An attempt has now been successfully made in this laboratory to prepare thorium borate hydrosol and hydrogel.

When a hot concentrated solution of borax is gradually added to thorium nitrate solution, a white precipitate of thorium borate is obtained which dissolves on vigorous shaking in presence of excess of thorium nitrate. In this way a considerable amount of thorium borate can be made to disperse in thorium nitrate. If this mixture be now kept in a parchment bag and dialysed until free from electrolytes, a clear colourless sol of thorium borate is obtained. The sol can be shown by electrophoresis to be positively charged.

A sol was prepared by allowing a hot 20 per cent solution of borax to run slowly into 75 c.c. of 10 per cent thorium nitrate solution until the precipitate of thorium borate scarcely dissolved in thorium nitrate on vigorous shaking. The mixture was dialysed at room temperature (30° C.) for eight days. The analysis of the coagulum of the sol obtained by the cataphoretic method indicated that the empirical formula of the sol was $4ThO_2.Th_3(BO_3)_4$.

The sol could be easily coagulated with electrolytes; and when *N* potassium chloride and *N*/5 potassium sulphate were used as coagulators, the sol formed beautiful transparent jellies. The influence of the variation of the concentration of the coagulating electrolytes on the time of setting of the gel is shown in the table:

Amount of sol taken = 2 c.c.; total volume = 3 c.c.

Amount of *N*/5 K_2SO_4 (c.c.)	Time of setting (min.)	Amount of *N* KCl (c.c.)	Time of setting (min.)
0·28	2	1·00	4
0·26	4	0·80	8
0·24	7	0·60	12
0·22	10	0·40	20
0·20	15	0·20	52

These jellies are quite stable and can usually be kept for days without appreciable change. On vigorous shaking they assume a liquid form, and the viscous liquid so obtained again sets to a jelly on standing; this process can be repeated several times. These jellies are therefore thixotropic in nature.

My thanks are due to Dr. Satya Prakash for valuable suggestions and his interest in this investigation.

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[1] Berzelius, *Pogg. Ann.*, **16**, 385 (1829).
[2] Karl, *Z. anorg. Chem.*, **68**, 57 (1910).
[3] Guertler, *Z. anorg. Chem.*, **40**, 232 (1904).

Differentiation between Glucose, Galactose and Mannose by a Colour Reaction

THREE naturally occurring aldohexoses—glucose, mannose and galactose—can readily be differentiated by the following method. Add 2 mgm. of the unknown sugar material to a solution of pyrocatechol at a concentration of 0·2 per cent in 85 per cent phosphoric acid syrup. Heat for 15 min. in a boiling water bath, shaking vigorously at the end of the first minute of heating to effect solution of the sugar. In these conditions, glucose produces a lilac colour, mannose produces a brown colour and galactose produces a red colour intermediate in quality between the colours afforded by glucose and mannose. The test is applicable equally to free and polymerized aldohexose. Amino-acids (apart from tryptophane) and gelatine do not produce colour in these conditions, and do not interfere even in large amount with this test.

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Influence of Gonadal Hormones on the Serum Lipochrome and Riboflavin of the Domestic Fowl

TRICHLORACETIC acid filtrates of serum were prepared during an investigation of the effects of gonadal hormones on the mineral metabolism of the immature pullet. Such preliminary removal of protein is essential in determining serum calcium where much vitellin or phospholipid is present, as is the case in laying birds or birds treated with œstrogen. It was noticed that filtrates from the sera of the pullets (fourteen weeks old) were tinted a greenish-yellow colour in the case of those birds receiving heavier doses of œstrogen, while the sera of birds not receiving œstrogen were colourless. A direct dietary influence was excluded because the birds, which were of the same strain and hatching, had been reared together under the same conditions and had, for three weeks before the observations, received the same amounts daily of the same diet.

The fact that the trichloracetic acid precipitate removes lipid material as well as protein prompted an examination for the presence

Pullet No.	Total dose œstradiol dipropionate (Ciba) (mgm.)*	Total dose testosterone propionate (Ciba) (mgm.)*	Serum calcium (mgm./100 ml.)	Plasma lipochrome, (Lovibond yellow units)**	Serum riboflavin (p.p.m.)
25	0	0	12·6	0·6	trace ?
26	6	0	17·4	0·8	0·05
27	12	0	38·3	1·2	0·27
28	24	0	97	1·6	1·22
29	0	8·25	12·4	0·8	trace ?
30	6	8·25	28·6	0·8	0·09
31	12	8·25	76	1·4	0·39
32	24	8·25	100	1·7	1·25

* Divided into six doses administered intramuscularly on alternate days.
** Alcohol-ether extract (10 ml.) of 0·5 ml. plasma examined in 2 cm. cell.