ON CURTIUS AND GOEBELS' GLYCINE ANHYDRIDE SILVER.(1)

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In the preceeding report,(2) a molecular compound of glycine anhydride was described which was presumed to be an intermediate product in the formation of Curtius and Göbels' glycine anhydride silver.(3) The author, thereafter, examined whether other silver compound could behave like the nitrate.

When an excess of saturated aqueous solution of glycine anhydride was added to silver oxide newly precipitated, no appreciable change seemed

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(1) The III report of the "Studies on Amino-acid Anhydrides." I report, see this Bulletin, **3** (1928), 151; II report see *Hoppe-Seyler's Zeit. f. physiol. Chem.*, **179** (1928), 83.

(2) II report.

(3) *J. prakt. Chem.*, (2) **37** (1888), 178.

to occur, but on addition of a small quantity of ammonia solution under vigorous agitation the precipitate of silver oxide turned its colour from brown to gray white; the product is soluble either in excess of ammonia or nitric acid. The course of this reaction and the appearance and some properties of the product remind us of the Curtius and Göbels' silver compound, except that the compound now obtained by the present author was much more unstable, a colour change being observed within half an hour or so. In order to avoid this rapid change the author tried to prepare this substance in a dark chamber illuminated by a red light, but it was found that this precaution has been less effective. The black substance, dried in vacuo was proved to possess different properties from silver oxide: on heating it decomposes explosively just like the Curtius and Göbels' compound. The analytical results of the changed product were also proximate to those of the known silver compound of these authors. Thus the unchanged gray white substance, although it was not allowed to be isolated, would possibly be an identical or isomeric substance with the Curtius and Göbels' compound.

Experimental.

Silver nitrate (4.5 gr.) was dissolved in water, warmed on a water-bath and an excess of potassium hydroxide solution was then added under stirring. On standing for a few minutes, when silver oxide so formed flockulated and settled, the supernatant liquid was decanted. The oxide was several times washed and decanted with pure water and was suspended in 200 c.c. saturated solution of glycine anhydride, the content of anhydride being about 2 gr. When some five c.c. of 10% ammonia solution was poured into the liquid under constant agitation, the brown colour of silver oxide turned then gradually to grayish white. In this case the precipitate of silver oxide must necessarily be crushed, otherwise it seems that the change occurs only on the surface of silver oxide.

The product was quickly separated from liquid by a centrifugal machine, washed several times with water on the machine and quickly transferred into the desiccator of brown glass and dried under a reduced pressure. In the course of this operation the product changes gradually its colour. Before analysis it was brought into a brown glass tube and further dried at 50–60° in Abderhalden's desiccating apparatus.

Analysis. Silver: the substance was dissolved in nitric acid and the silver was precipitated with hydrochloric acid, as chloride. Subst.=0.4106, 0.7798 gr.; AgCl=0.3588, 0.6861 gr. Found: Ag=65.79, 66.24%. Calc. for $C_4H_4N_2O_2Ag_2$: Ag=65.88%.

Nitrogen: Micro-Kjeldahl. Subst.=10.32, 17.65 mg.; HCl (1/70 N.) required=4.16, 6.97 c.c. Found: N=8.06, 7.90%. Calc. for $C_4H_4N_2O_2Ag_2$: N=8.54%.

The rather low value of nitrogen is presumably attributed to the incomplete reaction in the formation of silver compound.

Appendix. It was recently reported by Ch. Gränacher, G. Wolff and A. Weidinger(1) that silver compound of Curtius and Göbel could only be formed with glycine anhydride and not with its homologues, i.e. other amino-acid—and dipeptide-anhydrides. According to the present author's experience, the molecular compound of silver nitrate was also obtained only with glycine anhydride and other anhydrides gave no such compounds under the same condition. This parallelity would perhaps be an indirect proof to the author's assumption stated in the preceeding report.

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(1) *Helv.*, **11** (1928), 1229.