therefore in accordance with the predictions that would be made from a consideration of the properties of the two elements.

Summary

The method of ionic migration has been applied to the separation of zirconium and hafnium. After prolonged electrolysis of an agar gel containing these elements as complex anions, a slight but nevertheless distinct concentration of hafnium in the rear of the section occurred, a difference of some 2% in the average atomic weights of front and rear segments being consistently established. The degree of separation, however, was much smaller than that previously attained in the application of the method to the rare-earth metals. An attempt is made to correlate the similarity of the velocities of zirconium and hafnium ions, contrasted with the considerable differences which apparently exist in the rare-earth group, with prevalent notions of the atomic structures of the elements in question.

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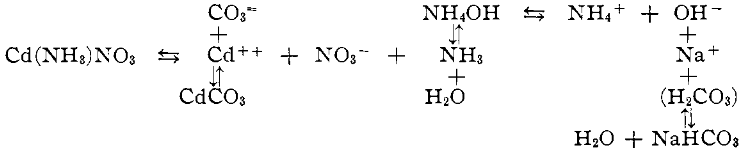
NOTE

A Test for Cadmium in the Presence of Copper.—In the course of development of schemes of qualitative analysis numerous methods have been devised for the separation of cadmium from copper; perhaps the most satisfactory of these is the cyanide method. Most of the other methods present difficulties of one sort or another. The following is a test for cadmium in the presence of copper.

The test is based on the fact that there is a marked difference in the solubility of copper and cadmium carbonates and also a difference in the stability of the copper- and cadmium-ammonia complexes which results in a still greater difference in the solubility of the carbonate salts in the presence of ammonia. When ammonium chloride is added to a solution of a copper salt and an excess of sodium bicarbonate is then added, there is a deepening of the blue color, indicating that one of the copper-ammonia complexes has been formed. When a solution of a cadmium salt is similarly treated a precipitate of cadmium carbonate is formed which is insoluble in an excess of either reagent. This is probably due to the fact that the equilibrium



$$\begin{array}{ccccccc}
 & CO_3^{=} & & NH_4OH & \leftrightarrows & NH_4^+ + & OH^- \\
 & + & & \downarrow\uparrow & & & + \\
Cd(NH_3)NO_3 \leftrightarrows & Cd^{++} & + NO_3^- + & NH_3 & & & Na^+ \\
 & \downarrow\uparrow & & + & & & + \\
 & CdCO_3 & & H_2O & & & (H_2CO_3) \\
 & & & & & & \uparrow\downarrow \\
 & & & & & H_2O + & NaHCO_3
\end{array}$$

is not shifted far enough to the left to form the complex with cadmium as it does with copper. If the normal carbonate is used in place of the bicarbonate, the equilibrium is shifted sufficiently to allow no precipitate with either cadmium or copper.

In carrying out the test the ammoniacal filtrate is taken from the bismuth separation, the excess of ammonia is removed either by boiling or by careful neutralization with acid. If sufficient ammonium salts have not been added in the course of the analysis, 3 or 4 cc. of a 10% solution of ammonium chloride is added at this time. The solution is then treated with an equal volume of saturated sodium bicarbonate solution. The presence of cadmium is indicated by a turbid, white precipitate which is easily noted in contrast to the clear blue of the copper solution.

The test is sensitive to about 0.1 mg. per cc., which can be detected without difficulty in the presence of five times that amount of copper. Failure to remove mercury or lead before the bismuth separation does not interfere with the test.

CONTRIBUTION FROM THE CHEMICAL LABORATORY
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RECEIVED MAY 17, 1926
PUBLISHED OCTOBER 6, 1926

[CONTRIBUTION FROM THE POLARIMETRY SECTION OF THE BUREAU OF STANDARDS, UNITED STATES DEPARTMENT OF COMMERCE][1]

THE OCCURRENCE OF GENTIOBIOSE IN THE PRODUCTS OF THE COMMERCIAL HYDROLYSIS OF CORN STARCH[2]

BY HENRY BERLIN[3]

RECEIVED FEBRUARY 10, 1926 PUBLISHED OCTOBER 6, 1926

Introduction

In the manufacture of crystalline *d*-glucose by the hydrolysis of corn starch with weak hydrochloric acid, a final mother liquor is obtained that is of great concern to the industry because of its quantity and its undesirable influence upon the rate of crystallization and yield of the sugar. This mother liquor, commercially known as "hydrol," consists approximately of 70% of fermentable and 30% of unfermentable material on the basis of dry substance. The fermentable part of "hydrol" is chiefly *d*-glucose. This conclusion follows from a comparison of the weight of carbon dioxide developed during fermentation and the accompanying loss in reducing sugar. The unfermentable part resembles closely in physical and chemical properties the saccharine material that is known in sugar chemistry as "isomaltose." This name was first used by Emil Fischer[4]

[1] Published by permission of the Director of the Bureau of Standards, United States Department of Commerce.

[2] An abstract of this paper was presented before the Sugar Division of the American Chemical Society at the meeting held in Los Angeles, California, August, 1925.

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[4] Fischer, *Ber.*, **23**, 3687 (1890).