

tion, so a satisfactory analysis of this material was not obtained and therefore it does not appear in the above table.

Anhydromercuri-hydroxymercuri and di-hydroxymercuri derivatives were obtained by moistening the di-chloromercuri compounds with ethyl alcohol and treating with hot (10%) sodium hydroxide solution. The mixture was filtered and the sodium hydroxide washed from the residue which was dried in a vacuum oven. In the case of the di-hydroxymercuri-*o*-benzylphenol and the di-hydroxymercuri-*o*-cyclohexylphenol, it was found necessary to neutralize with dilute hydrochloric acid in order to cause precipitation. Due to the difficulty of drying the former, a satisfactory analysis of this material was not obtained.

Summary

The following ten mercury derivatives of ortho and para cyclohexylphenol and ortho and para benzylphenol have been prepared and analyzed: di-acetoxymercuri-*p*-benzylphenol, di-acetoxymercuri-*o*-benzylphenol, di-acetoxymercuri-*p*-cyclohexylphenol, di-acetoxymercuri-*o*-cyclohexylphenol, di-chloromercuri-*p*-benzylphenol, di-chloromercuri-*p*-cyclohexylphenol, di-chloromercuri-*o*-cyclohexylphenol, anhydromercuri-hydroxymercuri-*p*-benzylphenol, di-hydroxymercuri-*p*-cyclohexylphenol, and di-hydroxymercuri-*o*-cyclohexylphenol.

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[CONTRIBUTION FROM THE DEPARTMENT OF CHEMISTRY, UNIVERSITY OF ALABAMA]

FORMIC ACID FROM HYDROLYSIS OF CELLULOSE OXALATE¹

BY JACK P. MONTGOMERY

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One of the usual laboratory methods for making formic acid is to prepare glyceryl mono oxalate, convert it to glyceryl mono formate by heating, and hydrolyze by adding more crystallized oxalic acid, the water of the crystallized acid serving as that required for the hydrolysis. Finally, steam distillation completes the hydrolysis and delivers all the formic acid produced.²

It has been found that cellulose in the form of absorbent cotton can be substituted for glycerine with some changes in the technique of the process.

Procedure.—Eighty grams of crystallized oxalic acid, 100 g. of absorbent cotton and 100 cc. of concentrated hydrochloric acid are required. The oxalic acid is melted in its water of crystallization in a 1000-cc. round-bottomed flask over the water-bath and the cotton, torn into small bits, thoroughly shaken with it. The hydrochloric acid is added and the flask

¹ Presented before the Division of Cellulose Chemistry of the American Chemical Society at the Indianapolis Meeting, March 30–April 3, 1931.

² Cohen, "Practical Organic Chemistry," 3rd ed., The Macmillan Co., Preparation 47, p. 130.

connected for steam distillation in the usual manner, the flask being supported on gauze and tripod and not on the water-bath. Before the admission of steam, the flask is heated by the burner flame and kept boiling until about 50 cc. of distillate is obtained. The distillate is returned to the flask, 100 cc. of water added and the mixture steam distilled until about 150 cc. of distillate is collected.

Lead oxide is added to the distillate in slight excess and the liquid filtered. The filtered liquid is evaporated to small bulk and allowed to crystallize. The yield is 65 g. of lead formate, equivalent to 20 g. of formic acid. If it is assumed that one mole of oxalic acid gives one mole of cellulose mono formate and that the cellulose mono formate is completely converted to formic acid, it follows that one mole of oxalic acid in this procedure should yield, theoretically, a maximum of one mole of formic acid. On this basis 126 g. of crystallized oxalic acid will give 46 g. of formic acid.

$$126 : 46 :: 80 : X$$

$$X = 27.2$$

The theoretical yield of formic acid is therefore 27.2 g. If desired, the formic acid is recovered by dissolving the lead formate, precipitating the lead with hydrogen sulfide and distilling off the formic acid.

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THE CHEMISTRY OF ORGANIC GOLD COMPOUNDS. II. THE PREPARATION AND PROPERTIES OF GOLD-CARBON COMPOUNDS OF THE TYPE R_2AuX AND $RAuX_2$ ¹

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Introduction

In 1902 Pope and Gibson³ published a paper on the preparation of diethyl auric bromide and ethyl auric dibromide. Diethyl auric bromide was prepared by the action of ethylmagnesium bromide upon an ethereal solution of auric bromide. Ethyl auric dibromide was prepared by subjecting diethyl auric bromide, dissolved in chloroform, to the action of bromine.

¹ Published by permission of the Surgeon-General.

² This work, as well as the other papers on organo-gold compounds in this series, was submitted by H. S. Isbell in 1926 to the Graduate School of the University of Maryland in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

³ Pope and Gibson, *J. Chem. Soc.*, 91, 2061 (1902). This early work was recently repeated and confirmed by Gibson and Simonsen (*ibid.*, 2531 (1930)), who prepared, in addition, diethyl gold iodide and diethyl gold acetylacetone.