The Polymerization of 2-Methyl-4-chloromethylthiazole.—The thiazole was polymerized by allowing it to stand at room temperature and also by heating at 75, 90 and 110–115°. The products so far as observed were identical in all cases. The highest temperature was found preferable since the reaction went more nearly to completion and proceeded at a more rapid rate. The polymerized product was freed from unchanged thiazole by sucking dry on a Buchner funnel and by washing with ether. The product was purified by recrystallization from hot absolute alcohol followed by precipitations from absolute methyl alcohol with ether and with ethyl acetate, and was dried over phosphorus pentoxide in a vacuum desiccator.

Anal. Calcd. for C_5H_6NSCl: C, 40.65; H, 4.10; N, 9.49; S, 21.72; Cl, 24.03. Found: C, 40.51; H, 4.36; N, 9.21; S, 21.52, 21.70; Cl, 23.92.

Molecular weight determinations (freezing point depression in glacial acetic acid). Calcd. for $(C_5H_6NSCl)_2$: mol. wt., 295. Found: mol. wt., 315, 278.

Summary

1. 2-Methyl-4-chloromethylthiazole has been prepared and has been found to readily polymerize to form a bimolecular product.

2. It has been concluded that this polymerization is analogous to the transformation of ω-haloethyl dialkylamines into cyclic quaternary salts, and that the polymerization product may be represented structurally as a piperazine derivative.

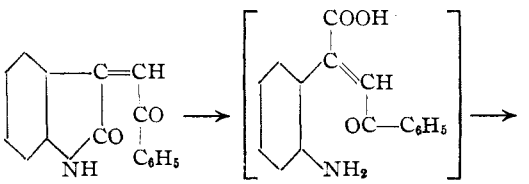
NEW HAVEN, CONN. RECEIVED NOVEMBER 1, 1933

[CONTRIBUTION FROM THE NICHOLS LABORATORY OF NEW YORK UNIVERSITY]

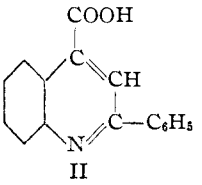
A Synthesis of Cinchophens from Phenacylideneoxindoles[1]

BY R. N. DUPUIS AND H. G. LINDWALL

It has been reported[2] that 3-phenacylideneoxindole (I) cannot be converted successfully to cinchophen (II) under the conditions of the Pfitzinger[3] reaction (33% aqueous alcoholic potassium hydroxide). It has been found, however, that if compound I is warmed with aqueous-alcoholic hydrochloric acid, rearrangement takes place with the formation of cinchophen.



I



II

The rearrangement evidently involves hydrolytic opening of the oxindole ring at the amidic linkage followed by reaction of the primary amino group with the carbonyl. This reaction has been applied also to the formation of certain cinchophen derivatives, as indicated in the Experimental Part. While better yields are obtained when hydrochloric acid is used, sulfuric acid of the same concentration may be substituted.

The method is being studied further particularly from the point of view of synthesis of amino and 3,4-dihydroquinoline derivatives. It suggests itself as a means of synthesis of alkali-sensitive quinoline derivatives from isatin, avoiding strenuous alkali treatment.

Experimental Part

Rearrangement of 3-Phenacylidene-oxindole (I) to Cinchophen (II).—A mixture of 2 g. of I (crude), 20 cc. of 95% ethyl alcohol, and 20 cc. of concd. hydrochloric acid was heated under reflux for two hours at 120°. A dense precipitate was formed upon cooling. This material was dissolved in alkali and reprecipitated with acid. The product at this stage is already in a high state of purity. Crystallization from alcohol yielded a product which was identified as 2-phenylcinchoninic acid (cinchophen), by melting point (210–212° corr.) and melting point mixed with a known sample. The identity of cinchophen was confirmed by decarboxylation to form 2-phenylquinoline (m. p. 83–84.5°). This general procedure was followed in the preparation of the para-substituted cinchophens listed in Table I.

4'-Methyl-2-phenylcinchoninic acid[4] was identified by its melting point, mixed with a known sample. Preparation from it of 2-(*p*-tolyl)-quinoline by decarboxylation was confirmation of identity.

4'-Bromo-2-phenylcinchoninic acid[5] was identified in the same way.

(1) Presented in part at the Chicago Meeting of the American Chemical Society, September, 1933.

(2) Lindwall and Maclennan, THIS JOURNAL, **54**, 4739 (1932).

(3) Pfitzinger, *J. prakt. Chem.*, **33**, 100 (1886); **38**, 583 (1888); **56**, 283(1897).

(4) Von Braun and Brauns, *Ber.*, **60**, 1255 (1927).

(5) Lindwall, Bandes and Weinberg, THIS JOURNAL, **53**, 317 (1931).

TABLE I

Reactant: -phenacylidene oxindole	Product: -cinchophen	M. p., °C. (corr.)	Yield (crude), %	Time of heating, hours
p-Methyl-	4′-Methyl-	212–214	95	2
p-Chloro-	4′-Chloro-	243–245	65	12.5
p-Bromo-	4′-Bromo-	242–244	85	6
....	....	210–212	72	2

4′-Chloro-2-phenylcinchoninic acid apparently has not been characterized in the literature, although a study of its physiological activity has been made by Rotter.[6] It was prepared by the Pfitzinger method from isatin, as well as by the rearrangement method described above. The products were identical.

Anal. Calcd. for $C_{16}H_{10}O_2NCl$: Cl, 12.52. Found: Cl, 12.35, 12.32.

(6) Rotter, *Z. exptl. Path. Ther.*, **19**, 176 (1917).

Summary

Cinchophen and certain of its 4′-substituted analogs have been prepared by rearrangement, respectively, of 3-phenacylidene oxindole and para-substituted phenacylidene oxindoles under the influence of mineral acid.

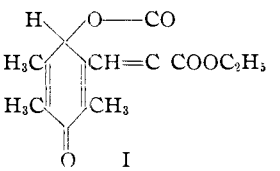
NEW YORK, N. Y. RECEIVED NOVEMBER 2, 1933

[CONTRIBUTION FROM THE SCHOOL OF CHEMISTRY OF THE UNIVERSITY OF MINNESOTA]

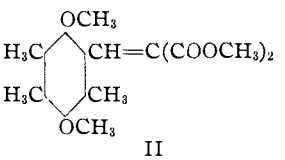
The Reaction between Duroquinone and Sodium Malonic Esters. II. The Synthesis and Reactions of 2,5-Dimethoxy-3,4,6-trimethylbenzaldehyde

BY LEE IRVIN SMITH

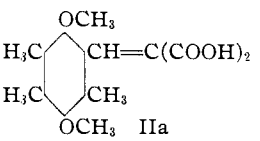
In the first paper of this series[1] the results of an investigation of the reaction between duroquinone and various sodium malonic esters were described. The primary product was a yellow crystalline compound, melting at 184°, to which was assigned the structure I.



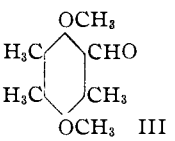
I



II



IIa



III

The substance I was hydrolyzed to an acid, and when this acid was exhaustively methylated, it gave a tetramethyl derivative II, which on careful hydrolysis yielded a dibasic acid, IIa. When this dibasic acid was oxidized, the products were oxalic acid and a substance $C_{12}H_{16}O_3$, to which was assigned the structure III.

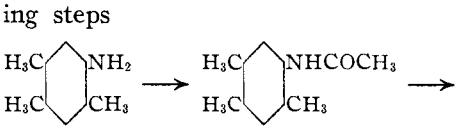
The substance III gave nitrotrimethylquinone with nitric acid, showing the presence of three methyl groups attached to the ring: Zeisel determinations showed two methoxyl groups; and these facts, together with the composition of the substance, left only one C, one H and one O not accounted for. Since the compound formed an oxime, these three atoms were assumed to be part of an aldehyde group, and the structure III written for it. But although III took up two hydrogen atoms on reduction, and the reduction product could be oxidized back to III, the substance could not be oxidized further to give an acid.

Because of the uncertainty regarding the structure of III, the aldehyde has been synthesized in another way. The synthetic product is identical with the compound III; it gives the same oxime, and the acid obtained by hydrolyzing the condensation product of the aldehyde and dimethyl malonate is identical with the dibasic acid, IIa, described in the previous paper. There is, therefore, no further doubt as to the structure of the compounds II, IIa and III.

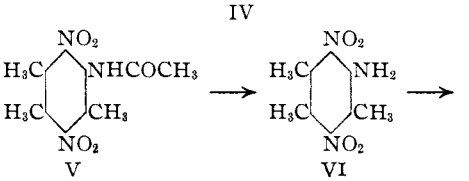
The work on the reaction between various substituted quinones and substances of the malonic and acetoacetic ester types is being continued in the hope of elucidating the mechanism of the peculiar oxidation reactions involved.

Experimental Part

The route to the aldehyde involved the following steps



IV



V VI

(1) Smith and Dobrovolny, THIS JOURNAL, **48**, 1693 (1926).