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Tatsuo Ohta and Yo Mori: Furoquinolines. IX.¹⁾ Synthesis of 5-Methylfuro[3,2-*c*]quinolin-4(5*H*)-one via Perkin Rearrangement of 3-Bromo-5,6-dihydro-6-methyl-2*H*-pyrano[3,2-*c*]quinoline-2,5-dione.

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The syntheses of 5-methylfuro[3,2-*c*]quinolin-4(5*H*)-one (I) have so far been accomplished by three routes.¹⁻³⁾ We would herewith like to report briefly on further synthesis of (I) by the unambiguous method.

1-Methyl-4-hydroxycarbostyryl (II) was condensed with malic acid to 5,6-dihydro-6-methyl-2*H*-pyrano[3,2-*c*]quinoline-2,5-dione (III), m.p. 225~227°, by means of conc. sulfuric acid.^{4,5)} Bromination of (III) and subsequent Perkin rearrangement of 3-bromo compound, m.p. 260°(IV), furnished 4,5-dihydro-5-methyl-4-oxofuro[3,2-*c*]quinoline-2-carboxylic acid (V), m.p. over 300°.⁶⁾ By treatment with diazomethane, (V) gave methyl ester (VI) of m.p. 207~208°. Finally, (V) was decarboxylated to yield 5-methylfuro[3,2-*c*]quinolin-4(5*H*)-one (I), m.p. 132~133°, which was quite identical with the sample obtained previously by the present authors.^{1,2)} The reaction sequence is illustrated in Chart 1.

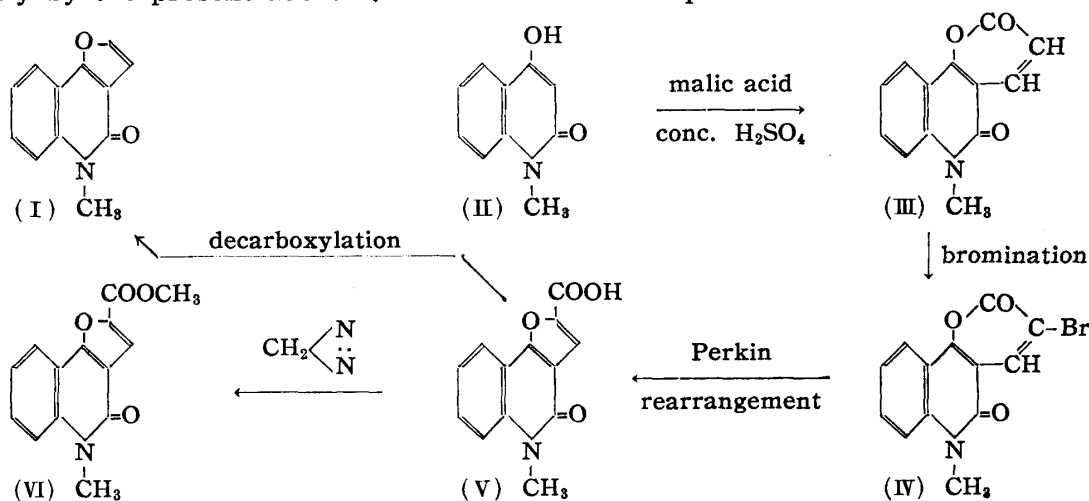


Chart 1.

Experimental**

All m.p.s are not corrected.

5,6-Dihydro-6-methyl-2*H*-pyrano[3,2-*c*]quinoline-2,5-dione (III)—To a solution of 1-methyl-4-hydroxycarbostyryl (6.0 g.) dissolved in warm conc. H₂SO₄ (32 cc.), malic acid (11.5 g.) was added. The mixture was heated on a water bath for 3 hrs. under intermittent shaking. After cool, the content was poured into an aqueous solution of AcONa (300 g. in 1250 cc.), then the whole was heated on a water bath for a while, and allowed to stand over night. The separated crystals were treated with

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** Analytical data are by Mrs. Y. Baba and Miss H. Oka, microanalytical room of the Women's Department of this College.

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2) T. Ohta, Y. Mori: This Bulletin, **4**, 415(1956).

3) M. F. Grundon, N. J. McCorkindale, M. N. Rodger: J. Chem. Soc., **1955**, 4284.

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6) This compound was recorded by Asahina and Inubuse (Ber., **65**, 61(1932)), who obtained it from 4,5-dihydro-4-oxofuro[3,2-*c*]quinoline-2-carboxylic acid by methylation, but there is no description of the properties of this compound.

NaHCO₃ solution and the insoluble portion was crystallized from EtOH with charcoal to dull pale yellow needles, m.p. 225~227°. Yield, 1.1 g. It is fairly soluble in hot EtOH and cold glacial AcOH. *Anal.* Calcd. for C₁₃H₉O₃N: C, 68.72; H, 3.99; N, 6.17. Found: C, 68.90; H, 4.13; N, 5.85.

3-Bromo-5,6-dihydro-6-methyl-2H-pyrano[3,2-c]quinoline-2,5-dione (IV)—A 10% bromine-glacial AcOH solution (6 cc.) was added to (III) (0.5 g.) dissolved in glacial AcOH (25 cc.), and this was sealed in a glass tube. After standing a week, the content was diluted with water and the crystals that separated out (0.5 g.) were collected, washed with water, and dried. It crystallized from glacial AcOH to pale yellow needles, melting clearly at 260° (fusing mostly into liquid at 248°). It is sparingly soluble in EtOH and soluble in hot glacial AcOH. *Anal.* Calcd. for C₁₃H₉O₃NBr: C, 51.00; H, 2.63; N, 4.58. Found: C, 50.55; H, 2.59; N, 4.42.

4,5-Dihydro-5-methyl-4-oxofuro[3,2-c]quinoline-2-carboxylic Acid (V)—A mixture of (IV) (0.7 g.) and 10% KOH solution (60 cc.) was heated on a water bath during 1 hr. After cool, the content was diluted with water and filtered. The pale yellow crystals that separated out from the filtrate by acidification with dil. H₂SO₄ were treated immediately with NaHCO₃ solution. The NaHCO₃-soluble portion was acidified with dil. H₂SO₄ and the separated crystals were crystallized from dehyd. EtOH with charcoal to colorless needles (0.4 g.), mp. over 300°. *Anal.* Calcd. for C₁₃H₉O₄N: C, 64.20; H, 3.73; N, 5.76. Found: C, 63.70; H, 3.97; N, 5.81.

Methyl 4,5-Dihydro-5-methyl-4-oxofuro[3,2-c]quinoline-2-carboxylate (VI)—(V) (0.2 g.) was methylated with CH₂N₂ in MeOH by the usual procedure. Colorless needles, m.p. 207~208° (from EtOH). *Anal.* Calcd. for C₁₄H₁₁O₄N·H₂O: C, 61.09; H, 4.76; N, 5.09. Found: C, 61.26; H, 4.12; N, 4.97.

5-Methylfuro[3,2-c]quinolin-4(5H)-one (I)—A mixture of (V) (0.2 g.), pure quinoline (3 cc.), and Cu powder (0.1 g.) was heated at 170~180° for 30 mins., further at 180~200° for 20 mins. After cool, the content was dissolved in 10% HCl and filtered. The filtrate was shaken with CHCl₃ and the solvent was removed by distillation. The NaHCO₃-insoluble matter of CHCl₃ residue was recrystallized from dil. EtOH to form colorless needles, m.p. 132~133°, which showed no depression on admixture with the specimen synthesized previously by another method.²⁾

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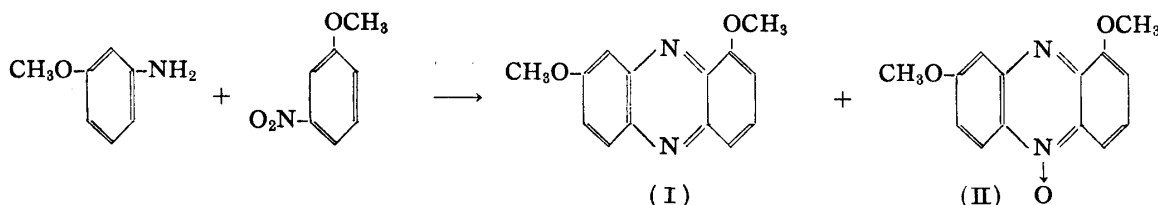
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2 Itiro Yosioka and Reiko Ashikawa: Studies on Phenazines. XIV¹⁾. Wohl-Aue Reaction of *m*-Anisidine and *m*-Nitroanisole.

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It was shown in the previous papers²⁾ of this series, that all the isomers of dimethoxyphenazine were synthesized by the improved Wohl-Aue method, but at that time condensation of *m*-anisidine and *m*-nitroanisole was not carried out.

This time *m*-anisidine was condensed with *m*-nitroanisole by the aid of potassium hydroxide in toluene solution and 1,8-dimethoxyphenazine (I) and its 5-N-oxide (II) were obtained. The latter was deoxygenated by heating with glacial acetic acid and zinc powder to form 1,8-dimethoxyphenazine.



In this reaction the anticipated 1,6- and 2,7-dimethoxyphenazines were not produced.

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