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REACTION OF 3-SUBSTITUTED QUINOLINE N-OXIDES WITH PHENYL ISOCYANATE

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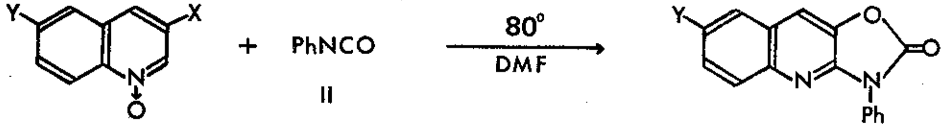
3-nitro- and 3-bromoquinoline N-oxides react with phenyl isocyanate at 80° in DMF to afford 3H-2-oxo-3-phenyloxazolo[4,5-b]quinoline through the primary adduct of the 1,3-dipolar cycloaddition reaction. 3,6-Dibromoquinoline N-oxide similarly gives the corresponding 7-bromo derivative.

In the course of the study on reaction of 3-substituted quinoline N-oxides, we have happened to come across a novel reaction of 3-nitroquinoline N-oxide (Ia) with phenylisocyanate (II) which gave a cyclic product resulting from the primary cycloadduct of Ia and II. After completion of this work, we were informed that Hisano and his co-workers[1] had obtained the same type of product from the reaction of 3,5-dibromopyridine N-oxide with II. Therefore, it was decided that both groups report the respective works at the same time.

3-Nitroquinoline N-oxide (Ia) was treated with phenyl isocyanate

(II) at 80° in DMF for 8 h. The crystalline residue obtained on evaporation of the reaction mixture was washed with ether and recrystallized from benzene to afford 3H-2-oxo-3-phenyloxazolo-[4,5-b]quinoline (IIIa), mp 238-240°, as colorless needles in 25% yield.

Structure assignment[2] of IIIa is based on the satisfactory elemental analysis [$C_{16}H_{10}O_2N_2$], the ir spectrum [ν_{max}^{KBr}: 1774, 1785 cm^{-1} (C=O)] and the mass spectrum [M^+: m/e 262.075, calcd. 262.074 ; M^+-CO_2: m/e 218.083, calcd. 218.084]. Treatment of IIIa at room temperature with 10% sodium hydroxide in ethanol smoothly produced 2-anilino-3-quinolinol (IV) accompanied by decarboxylation in the quantitative yield. The compound IV forms yellow needles, mp 176-178°, from benzene and its microanalytical and spectral data were in good agreement with the assigned structure.



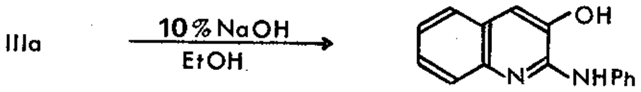
Ia : X=NO_2, Y=H

Ib : X=Br, Y=H

Ic : X=Y=Br

IIIa : Y=H

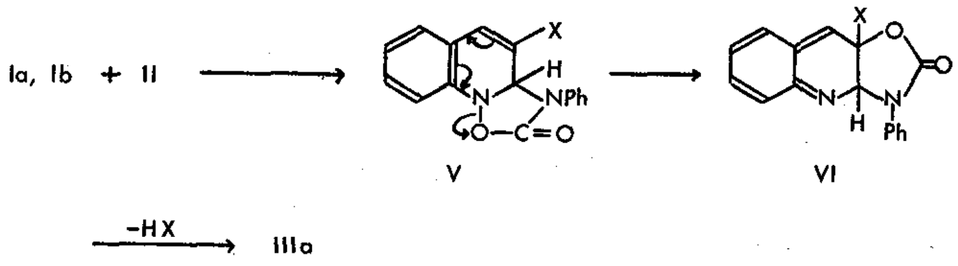
IIIc : Y=Br



IV

The reaction of 3-bromoquinoline N-oxide (Ib) and II similarly proceeded under the same condition, and IIIa was obtained in a somewhat lower yield of 11%. This result offers an additional evidence for the structure IIIa. It was further shown that 3,6-dibromoquinoline N-oxide (Ic) underwent also the same type of reaction to give 7-bromo derivative of IIIa (IIIc), mp 263-264° (EtOH-acetone), as colorless flocculent needles in 16% yield.

The formation of IIIa may be rationalized by the reaction course shown below. The cleavage of the N-O bond of the primary 1:1 cycloadduct (V) and the formation of C-O bond on the 3-position of the quinoline ring either by a two-step process or by a 1,5-sigmatropic shift leads to the second cyclic intermediate (VI). Elimination of nitrous acid or hydrogen bromide from VI affords the product IIIa. The somewhat lower yields of IIIa and IIIc compared with the case of 3,5-dibromopyridine N-oxide[1] may well be due to the intermediacy of VI in which the aromaticity of both pyridine and benzene nuclei is lost.



A number of reactions of aromatic N-oxides with acylating agents are known in which substitution at β- or the equivalent positions occurs by the similar N-O bond fission of N-O-acyl-1,2-

or -1,4-dihydropyridine intermediates and the nucleophilic attack by the liberated anion[3,4]. Apparently the mode of the above-mentioned reactions is closely similar to that of these ones.

Further work is in progress to examine the reaction using other 3-substituted quinoline N-oxides and various 1,3-dipolarophiles.

REFERENCES

1 T. Hisano, T. Matsuoka and M. Ichikawa, the preceding paper.

2 Since IIIa is sparingly soluble in chloroform, acetone, DMSO and DMF, the satisfactory data of the nmr spectrum have not yet been obtained.

3 E. Ochiai, "Aromatic Amine Oxides", Elsevier Publishing Co., Amsterdam, 1967, p. 248.

4 A. R. Katritzky and J. M. Lagowski, "Chemistry of the Heterocyclic N-Oxides", Academic Press, London and New York, 1971, p. 258.

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