Dipolar Cycloaddition Reactions of Quinoxalin-3(4*H*)-one 1-*N*-Oxides†

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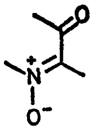
Summary Demonstrating their reactivity as 1,3-dipoles in cycloaddition reactions, quinoxalin-3(4*H*)-one 1-*N*-oxide (**3a**) and its *N*-methyl derivative (**3b**) react with the aryl isocyanates (**4a** and **b**) to give the corresponding 2-arylaminoquinoxalin-3(4*H*)-ones (**6a**—**c**); similarly, reaction with benzyne affords the 2-(*o*-hydroxyphenyl)-quinoxalin-3(4*H*)-ones (**9a** and **b**).



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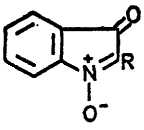

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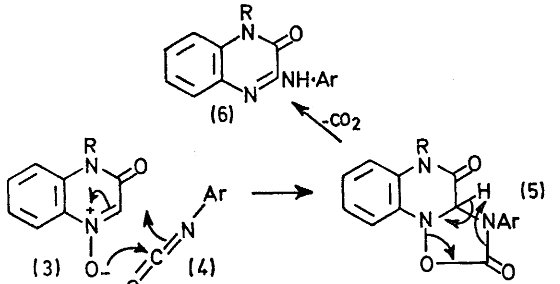
† Satisfactory analyses and spectral data were obtained for all new compounds.

C-ACYLNITRONES (**1**) show exceptionally fast rates[1] in 1,3-dipolar cycloaddition reactions.[2,3] In this respect, cyclic *C*-acylnitrones are of particular interest because of the stereochemical restraint imposed.[4] Dipolar cycloaddition reactions of substituted cyclic *C*-acylnitrones such as the isatogens (**2**) are well known.[5] However isatogen (**2**; R = H) itself is unknown, and presumably because of the inaccessibility of similar substrates, studies of the cycloaddition reactions of unsubstituted cyclic *C*-acylnitrones do not appear to have been described hitherto. We now report the preliminary results of a general investigation of the 1,3-dipolar reactivity of the readily accessible[6] heterocyclic *C*-acylnitrones (**3a** and **b**).



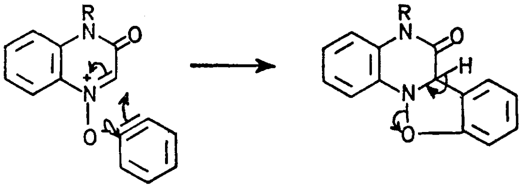
	R
a;	H
b;	Me

	Ar
a;	Ph
b;	p-Cl·C_6H_4

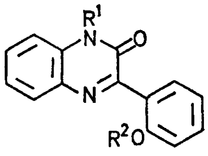
	R	Ar
a;	H	Ph
b;	Me	Ph
c;	Me	p-Cl·C_6H_4

The quinoxalinone *N*-oxide (**3b**) reacted readily with the isocyanates (**4a**) or (**4b**) to afford the 2-arylaminoquinoxalinones (**6b**) (53%), m.p. 187°, and (**6c**) (56%), m.p. 203°, which were identical with authentic samples prepared by reaction of 2-chloro-4-methylquinoxalin-3(4*H*)-one[7] with aniline and *p*-chloroaniline respectively. The *N*-oxide (**3a**) reacted similarly with phenyl isocyanate to yield the anilinoquinoxalinone (**6a**) (99%), m.p. 252°.

The *N*-oxides (**3a** and **b**) also reacted with benzyne[8] to afford the hydroxyphenylquinoxalones (**9a**) (95%), m.p. 307° and (**9b**) (94%), m.p. 212°. The structures of the products (**9a** and **b**) are based on the unambiguous synthesis of the methoxyphenylquinoxalone (**9c**), m.p. 171°, into which they are converted by methylation. Reaction of *N*-oxides of the types (**3a** and **b**) with arynes is potentially a valuable general route to 2-(*o*-hydroxyaryl)quinoxalin-3(4*H*)-ones.



(7) (8)



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	R^1	R^2
a;	H	H
b;	Me	H
c;	Me	Me

By analogy with the known reactions of nitrones with isocyanates[1,3] and with benzyne,[3,9] the reactions of the *N*-oxides (**3a** and **b**) with these reagents are formulated as 1,3-dipolar cycloadditions proceeding by the intermediate formation and subsequent transformation of the cycloadducts (**5**) and (**8**). These reactions demonstrate the potential value of the heterocyclic *C*-acylnitrones (**3a** and **b**) as substrates for the study of the 1,3-dipolar cycloaddition reactions of nitrones.

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[1] R. Huisgen, H. Seidl, and I. Bruning, *Ber.*, 1969, **102**, 1102.

[2] G. R. Delpierre and M. Lamchen, *Quart. Rev.*, 1965, **19**, 329; J. Hamer and A. Macaluso, *Chem Rev.*, 1964, **64**, 473; R. Huisgen, *Angew. Chem. Internat. Edn.*, 1963, **2**, 633.

[3] R. Huisgen, *Angew. Chem. Internat. Edn.*, 1963, **2**, 565.

[4] L. W. Boyle, M. J. Peagram, and G. H. Whitham, *J. Chem. Soc.* (*B*), 1971, 1728.

[5] H. Seidl, R. Huisgen, and R. Knorr, *Ber.*, 1969, **102**, 904; R. Huisgen, H. Hauck, H. Seidl, and M. Burger, *ibid.*, p. 1117; W. E. Noland and R. F. Modler, *J. Amer. Chem. Soc.*, 1964, **86**, 2086, and references cited therein; C. C. Bond and M. Hooper, *J. Chem. Soc.* (*C*), 1969, 2453.

[6] G. Tennant, *J. Chem. Soc.*, 1963, 2428.

[7] G. W. H. Cheeseman, *J. Chem. Soc.*, 1955, 1804.

[8] L. F. Fieser and M. Fieser, 'Reagents for Organic Synthesis', Wiley, New York, 1967, p. 46.

[9] S. Takahashi, S. Hashimoto, and H. Kano, *Chem. and Pharm. Bull.* (*Japan*), 1970, **18**, 1176; S. Takahashi and H. Kano, *ibid.*, 1964, **12**, 1290.