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A CONVENIENT AND SIMPLIFIED METHOD FOR SYNTHESIS OF 1,4-DIOXO-1,2,4,5-TETRAHYDROIMIDAZO[1,5-a]QUINOXALINES

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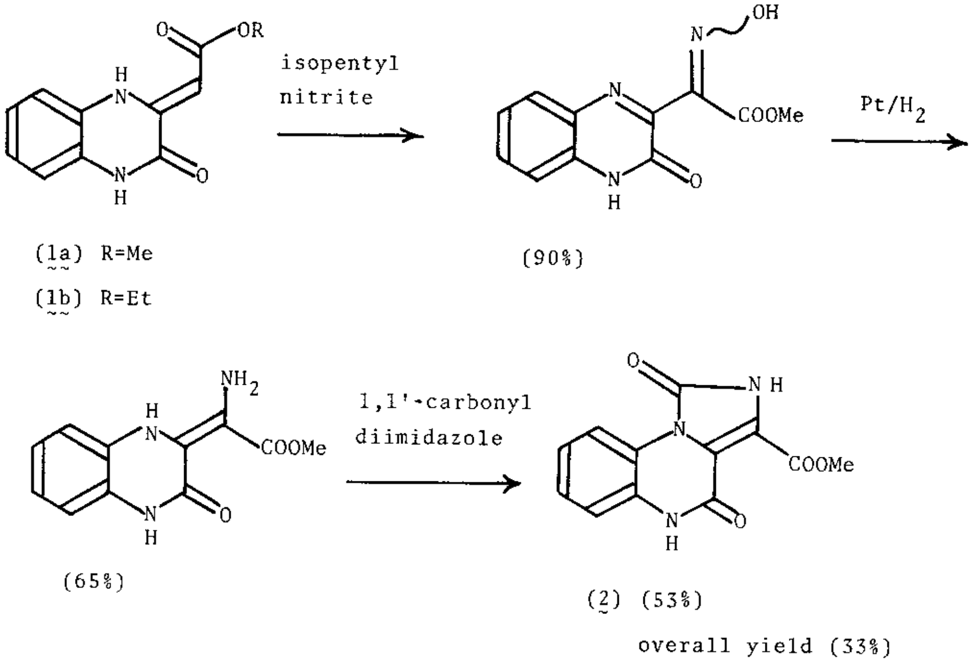
Abstract — 1,4-Dioxo-1,2,4,5-tetrahydroimidazo[1,5-a]quinoxalines were prepared via 3-azidocarbonylmethylene-2-oxo-1,2,3,4-tetrahydroquinoxaline from 3-hydrazinocarbonylmethylene-2-oxo-1,2,3,4-tetrahydroquinoxaline.

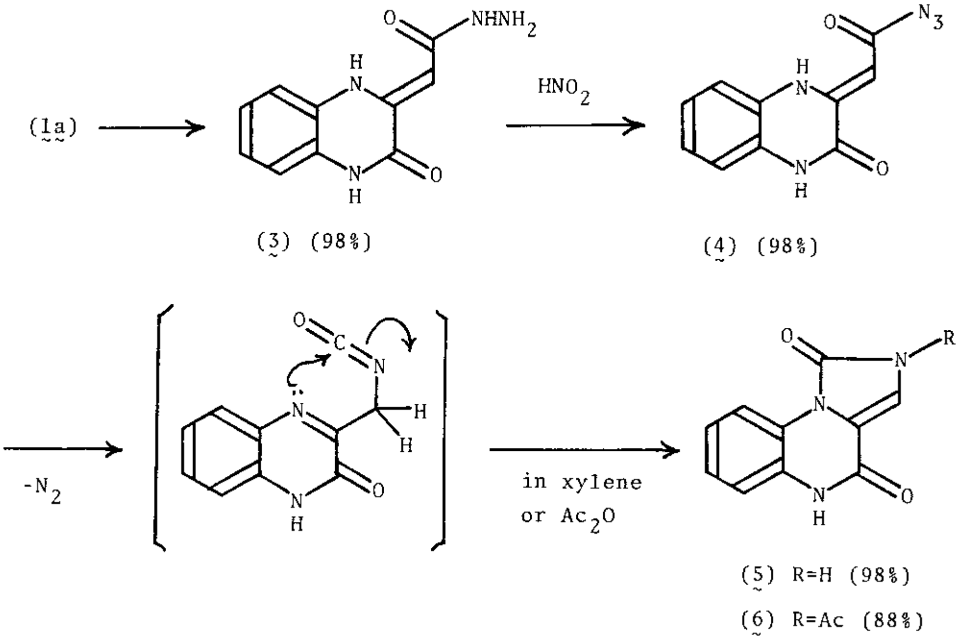
Recently, Danswan et al.[1] have reported the synthesis of methyl 1,4-dioxo-1,2-4,5-tetrahydroimidazo[1,5-a]quinoxaline-3-carboxylate (2) from 3-methoxycarbonylmethylene-2-oxo-1,2,3,4-tetrahydroquinoxaline (1a) by the process shown in Scheme 1. However, its overall yield was not so high (33%), and this route had to use rather troublesome and expensive catalyst in the reduction (Pt/H_2). We now describe a simplified and yield-improved method for preparation of 1,4-dioxo-1,2,4,5-tetrahydroimidazo[1,5-a]quinoxalines (5 and 6).

In a previous paper,[2] we found that 1 was readily converted to 3-hydrazinocarbonylmethylene-2-oxo-1,2,3,4-tetrahydroquinoxaline (3) (98%) by devising the reaction condition. The reaction of 3 (5 g, 22.9 mmol) with $NaNO_2$ (1.74 g, 25.2 mmol) in AcOH (4.13 g, 68.7 mmol)-H_2O (350 ml) precipitated 3-azidocarbonylmethylene-2-oxo-1,2,3,4-tetrahydroquinoxaline (4)[3] (5.12 g, 97.5%). Refluxing of 4 (5 g) in dry xylene (250 ml) or Ac_2O (250 ml) afforded 1,4-dioxo-1,2,4,5-tetrahydroimidazo[1,5-a]quinoxaline (5)[4] (4.41 g, 98%) or 2-acetyl-1,4-dioxo-1,2,4,5-tetrahydroimidazo[1,5-a]quinoxaline (6)[5] (4.15 g, 88%), respectively. Acetylation of 5 (1 g) with Ac_2O (50 ml) also provided 6 (1.07 g, 88%). Thus, 1,4-dioxo-1,2,4,5-tetrahydroimidazo[1,5-a]quinoxalines were obtained in high overall yields (5, 94%, 6, 84.5%) (Scheme 2).

In the conversion of 4 to 5, protic solvent decreased the yield of 5 (Table I), which was presumably due to the decomposition of the intermediary isocyanate (Scheme



Scheme 1



Scheme 2*

Table I. Conversion of 4 to 5 and 1b

Solvent**	Product (Yield %)
dry xylene	5 (98)
AcOH	5 (83)
AcOH-H_2O	5 (76)
EtOH-$NaHCO_3$	1b (80)

** 4 was refluxed in the respective solvents.

2) to amine, although any urea type of compound was not obtained. Furthermore, refluxing of 4 (1 g) in EtOH (50 ml) in the presence of $NaHCO_3$ (0.21 g) resulted in the formation of 1b (808 mg, 80%), indicating the exchange of $-N_3$ with -OEt prior to the Curtius rearrangement.

The structures of 5 and 6 were established in comparison of the ^{1}H-NMR data of 2 with those of 5 and 6.

REFERENCES AND NOTES

1. G. W. Danswan, P. W. Hairsine, D. A. Rowlands, J. B. Taylor, and R. Westwood, J. Chem. Soc. Perkin I, 1982, 1049.
2. Y. Kurasawa, Y. Moritaki, and A. Tkada, Synthesis, in press.
3. Yellow needles, m.p. 145 °C. ν(KBr) 2150 (N_3), 1680(C=O). When dissolving in a solvent, 4 was changed into 5 in part to give a mixture of 4 and 5. Signal for vinyl proton of 4 was observed at δ 5.51 ppm.
4. Recrystallization from EtOH afforded yellow needles, $C_{10}H_7N_3O_2 \cdot 1/2\ H_2O$, m.p. above 340 °C. ν(KBr) 3460(OH), 1720, 1660(C=O). δ(DMSO-$\underline{d}_6$) 11.22(s, 1H, NH), 10.82(s, 1H, NH), 8.58(m, 1H, 9-H), 7.40(s, 1H, 3-H), 7.20-6.90(m, 3H, 6-, 7-, 8-H). δ(CF_3COOH) 8.73(m, 1H, 9-H), 7.78(s, 1H, 3-H), 7.60-7.17(m, 3H, 6-, 7-, 8-H). Signals for NH protons were not observed in CF_3COOH.
5. Recrystallization from AcOH provided colorless needles, m.p. 335 °C. ν(KBr) 1730, 1685, 1645(C=O). δ(CF_3COOH) 8.67(m, 1H, 9-H), 8.13(s, 1H, 3-H), 7.50-7.13(m, 3H, 6-, 7-, 8-H), 2.90(s, 3H, acetyl Me). Signals for NH protons were not observed.

* Satisfactory mass spectral and microanalytical data were obtained for all new samples.

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