NOTES

Reaction of *N*-Methyl-4-(2′-octoxy)pyridinium Iodide with Silver Oxide. Evidence for a Mechanism Involving a Pseudobase Intermediate

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The reaction of optically active *N*-methyl-4-(2′-octoxy)pyridinium iodide with silver oxide results in the formation of optically active 2-octanol with 91% retention of configuration. A mechanism involving a pseudobase intermediate is consistent with this result.

La réaction de l'iodure de *N*-méthyl (octoxy-2′)-4-pyridinium optiquement actif avec l'oxyde d'argent a pour résultat la formation d'octanol-2 optiquement actif avec 91% de rétention de configuration. Un mécanisme faisant intervenir un intermédiaire pseudo-base est compatible avec ce résultat.

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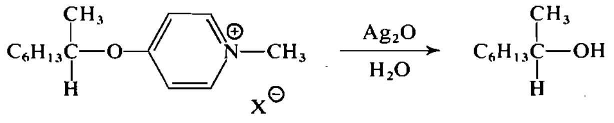
In connection with a study of the mechanism of the thermal elimination reaction of *N*-methyl 4-alkoxypyridinium iodides (1, 2), we wanted to prepare the corresponding hydroxides. An attempt was made to prepare *N*-methyl-4-(2′-octoxy)pyridinium hydroxide (**1***b*) by treatment of the methiodide (**1***a*) with silver oxide in water, in much the same manner (3) that alkyltrimethylammonium iodides are converted to quaternary alkyltrimethylammonium hydroxides. This procedure did not yield the expected hydroxide but instead gave 2-octanol, indicating cleavage of the heteroaromatic ether.

This alcohol can arise by any (or a combination) of the three mechanisms shown in Scheme 1. Pathway 1 involves solvolysis of the substrate via a carbonium ion (S_N1), a route that was proposed by Vogel and Roberts (4) for the solvolysis of cyclopropylcarbinyl derivatives in ethanol. Nucleophilic attack by hydroxide ion (S_N2) at the secondary carbon (pathway 2) leads directly to 2-octanol. A third possibility involves attack of hydroxide ion on the pyridine ring (S_NAr) leading to intermediate **2**, which can then subsequently decompose to give 2-octanol. A mechanism involving nucleophilic displacement by iodide ion on the alkyl group is ruled out by the results of pyrolysis of *N*-methyl-4-alkoxypyridinium iodides (1, 2).

In order to determine which route was operative, the *N*-methyl-4-alkoxypyridinium iodide derived from optically active 2-octanol was synthesized. In Scheme 1, pathway 1 should lead to largely racemized alcohol. Pathway 2 should result in 2-octanol of inverted configuration, while pathway 3 should lead to an alcohol with retained configuration.

We wish to report that treatment of optically active methiodide (**1***a*) with silver oxide in cold water gave a 17% yield of optically active 2-octanol with 91% retention of configuration. Since the reaction proceeds with a high reten-



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a X = I
b X = OH

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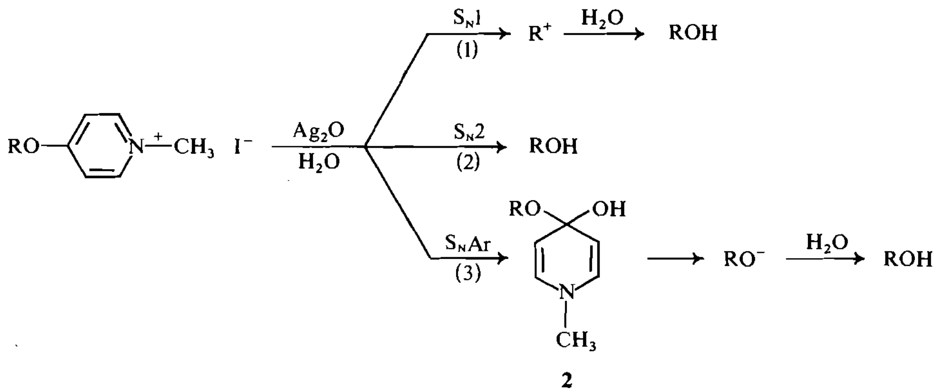

SCHEME 1. Possible mechanisms for cleavage of *N*-methyl-4-(2′-octoxy)pyridinium iodide.

tion of configuration, it may be concluded that little or no C_α—O bond breaking occurs, implying that pathway 3 is the major route for the formation of alcohol.

The reactions of aromatic nitro compounds with base have been shown (5) to involve Meisenheimer complexes. *N*-Alkyl derivatives would be expected to form similar complexes since the *N*-alkyl aza group and a nitro substituent both withdraw electrons from the ring by an inductive and conjugative mechanism. Evidence in support of such intermediates has been summarized by Illuminati (6). Recently Bunting and Meathrel (7) have presented evidence of the formation of pseudobases by the *N*-methyl cations of diazanaphthalenes. Our results are in accord with such a mechanism and indicate that this is the major route to the formation of 2-octanol in the hydroxide ion cleavage of *N*-methyl-4-(2′-octoxy)pyridinium iodide.

Experimental

Optical rotations were determined by means of a Perkin–Elmer 141 Polarimeter. Optically active 2-octanol was prepared by the method of Vogel (8). Elemental analyses were carried out by M. B. Gygli of Toronto, Ontario.

4-(d-2′-Octoxy)pyridine

This compound was prepared by a slight modification (2) of the method of Vogel and Roberts (4) to give 0.72 (76% yield) of the 4-alkoxypyridine, b.p. 98° (0.140 mm).

Anal. Calcd. for $C_{13}H_{21}ON$: C, 75.32; H, 10.21; N, 6.76. Found: C, 75.39; H, 10.29; N, 6.92.

Reaction of N-Methyl-4-(d-2′-octoxy)pyridinium Iodide with Ag_2O

To 0.72 g (3.48 mmol) of 4-(*d*-2′-octoxy)pyridine was added excess methyl iodide (3 ml; 48.1 mmol). After standing overnight, the excess methyl iodide was removed under vacuum to give 1.40 g of an orange oil. Previous work (2) with this material showed that the oil could not be induced to crystallize and so the material was used without further purification. To this oil was added 10 ml of water and 1.86 g (8.05 mmol) of silver oxide. The solution was allowed to stir for 4 h in an ice bath and then filtered. Distillation of the filtrate gave two layers. The distillate was extracted with ether, and the combined ether extracts dried over anhydrous magnesium sulfate. The ether was removed under vacuum to give 79 mg of 2-octanol, $[\alpha]_D^{23}$ 7.94 (*c* 4.0, EtOH), corresponding to 91% retention of configuration. No further purification of the material was attempted, meaning that 91% is a lower limit on the percent retention of configuration.

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