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Shigehiko Sugasawa and Makoto Kirisawa: Oxidation of 1-Methyl-3-ethylpyridinium Salt (A Correction).

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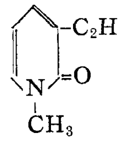
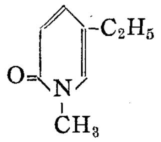
A few years ago, one of the present authors (S.S.) and Ban[1] reported that, when oxidized with alkaline potassium ferricyanide, 1-methyl-3-ethylpyridinium methosulfate yielded a liquid in 66% yield. Though it distilled ever a fairly wide range (b.p$_9$ 114~121°) it was assumed as a single pyridone, since every portion of the distillate gave one and the same crystalline picrate of m.p. 122~123°, whose analytical figures were in good agreement with those calculated for the expected pyridone picrate. Further evidence of its being 1-methyl-3-ethyl-2-pyridone (I) was also provided.

Some time later, the present authors[2] succeeded in preparing 1-methyl-3-ethyl-6-pyridone (II),† the constitution of which was proved beyond doubt. The picrate of this new pyridone formed yellow, well-defined crystals, which melted at 121~123°, and was not depressed on admixture with the one of m.p. 122~123°, obtained formerly by Sugasawa and Ban.[1]



(I)



(II)

The oxidation of 1-methyl-3-ethylpyridinium methosulfate was, therefore, reinvestigated under the same working conditions as were described by Sugasawa and Ban, when light brown oily pyridone was obtained in 76% crude yield.[3] On careful rectification, the crude product (5.2 g.) gave the following fractions:

Fraction	A	b.p$_{12}$	127°	0.11 g.
〃	B	〃	127~132°	4.69 g.
〃	C	〃	132~140°	0.13 g.
	D	Brown residue		0.25 g.

So the main fraction B distilled over a range of 5°. The ethereal solution of each fraction was now mixed with an ethereal solution of picric acid when the fraction C and the residue D soon gave the same precipitate of the yellow picrate, which melted at 121~123° after one purification from methanol and was proved to be identical with the picrate of 1-methyl-3-ethyl-6-pyridone by direct comparison. From fractions A and B only small amount of the same crystalline picrate separated after long standing. Thus it was proved that the oxidation product was a mixture of two isomeric pyridones.

It was further found that (II)-picrate is practically insoluble in cold ether whereas (I)-picrate is freely soluble in the same solvent. Thus the separation of two pyridones was made possible by virtue of their picrates. When the ethereal solution of the pyridone mixture (A~D inclusive) was mixed with an ethereal solution of picric acid

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[1] S. Sugasawa, Y. Ban: J. Pharm. Soc. Japan, **72**, 1336(1952).

[2] S. Sugasawa, M. Kirisawa: This Bulletin, **3**, 190(1955).

[3] Using more oxidizing agent, the crude yield was raised to 84%.

† This compound should be called 1-methyl-5-ethyl-2-pyridone, but for easy discrimination from its isomer this name is adopted here, by which the position involved in the oxidation reaction of the original compound can also be made more clear.

in equivalent quantity, there soon separated (II)-picrate almost quantitatively. After standing for some time, this was collected on a filter, washed with ether, dried, and weighed. From the filtrate the solvent was evaporated *in vacuo* and the oily residue, which solidified to a faint yellow mass of m.p. 50~58°, was dissolved in pure benzene in the cold, to which hexane was added to incipient turbidity, when yellow prisms of m.p. 60~62° (I-picrate) separated on standing. *Anal.* Calcd. for $C_{14}H_{14}O_8N_4$: C, 45.90; H, 3.85; N, 15.30. Found: C, 45.48; H, 3.51; N, 15.28.

The free 2-pyridone (I), recovered from the picrate, now distilled at b.p$_{11}$ 122~123° as a colorless oil.

From the yield of 6-pyridone (II), based upon the weight of its picrate, that of the 2-pyridone (I) could be calculated by subtraction and thus the proportion of (I) : (II) formed was found to be approximately 8 : 1.

Some time ago, Tatsuno[4] suggested that the constitution of 3-substituted pyridones can coveniently be deduced by comparing their dipole moment values with those of standard compounds. As was expected from the theoretical ground 6-pyridones have higher and the isomeric 2-pyridones have lower values than the standard compounds.

The dipole moments of the pure (I), (II), and 1-methylpyridone (III) were measured by the solvent method and the results are tabulated below, providing another support for the Tatsuno's proposal.

Pyridones	μ-Value	Difference
(I)	3.69	−0.34
(II)	4.48	+0.45
(III) (standard)	4.03	

In view of the present experimental result, the work by Sugasawa and Tatsuno[5] on oxidation of N-(β-3,4-methylenedioxyphenethyl)-3-ethylpyridinium salt may require some revision and reinvestigation is now under progress.

The authors' thanks are due to Mr. Y. Kamura for measuring dipole moments and to Mrs. F. Hisamichi for microanalytical data.

Summary

The report made by Sugasawa and Ban that the oily oxidation product, produced in 66% yield, of 1-methyl-3-ethylpyridinium methosulfate consisted of 1-methyl-3-ethyl-2-pyridone only, was in error, which was caused by a cursory examination of the distillation product. The present study revealed that the oily oxidation product was really a mixture of 1-methyl-3-ethyl-2- and -6-pyridone in proportion of approximately 8 : 1. Their separation was made possible through picrates, of which the one from the 2-pyridone is freely soluble in ether, whereas the other is practically insoluble in cold ether. By using the oxidation agent in a certain excess, the yield of the product attained as high as 84% of the theoretical.

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[4] T. Tatsuno: This Bulletin, **2**, 140(1954).

[5] S. Sugasawa, T. Tatsuno: *Ibid.*, **2**, 193(1954).