Derivation of 3-Oxazolin-5-ones from Methyl (4*S*,6*S*)-5,5,9,9-Tetramethyl-7-oxo-8-oxa-4-thia-1-azabicyclo[4,3,0]non-2-ene-3-carboxylate 4-Oxide

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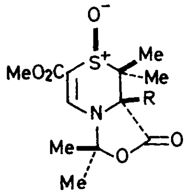
Summary Acetyl chloride converts the lactone sulphoxide (**1**) into the racemate of the hydroxy-lactone (**4**) under nitrogen; in the presence of oxygen the 3-oxazolin-5-one (**8**) is formed by way of the racemate of the hydroxy-lactone sulphoxide (**2**).

ALTHOUGH the chemistry of 2-oxazolin-5-ones (azlactones) has been extensively studied, much less is known about 3-oxazolin-5-ones (pseudo-oxazolones), particularly those derivatives bearing alkyl substituents at position 2.[1] We now report the derivation of 4-substituted 2,2-dimethyl-3-oxazoline-5-ones from the lactone sulphoxide (**1**).

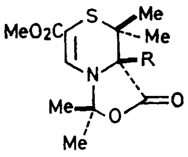
Derivative (**1**) is known to racemise in solution at room temperature.[2,3] In the hope of reducing it to the lactone (**3**) to assess its optical purity, the lactone sulphoxide (**1**),[3] $[\alpha]_D -44°$ ($CHCl_3$), was treated under nitrogen with acetyl chloride-sodium dithionite (3 mol. equiv. of each) in acetonitrile.[4] However, the product (99%), m.p. 171—174°, $[\alpha]_D$ 0° ($CHCl_3$), which was also formed when sodium dithionite was omitted from the reaction, was the racemate of the hydroxy-lactone (**4**).[3]

The foregoing reaction presumably involves the intermediacy of the sulphenic anhydride (**5**), formed from the acetoxysulphonium salt (**6**) by a β-elimination process. The ethoxysulphonium salt (**7**) undergoes an analogous reaction in the presence of sodium hydroxide.[3]

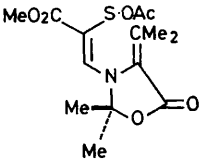
When the sulphoxide (**1**) was treated with acetyl chloride (2 mol. equiv.) in acetonitrile under oxygen, two new products were formed (*ca.* 4:1 by n.m.r. spectroscopy). Addition of ether to the mixture induced the crystallisation of the major component (72%), m.p. 173—175° (decomp.), $[\alpha]_D$ 0° ($CHCl_3$), which was the racemate of the hydroxy-lactone sulphoxide (**2**);† it was also obtained (86%) by oxidation of the racemate of the hydroxy-lactone (**4**) with *m*-chloroperbenzoic acid. The minor substance, isolated as an optically inactive syrup after rapid silica-gel chromatography, was considered to be the 3-oxazolin-5-one (**8**).

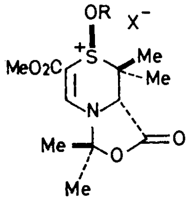

(1) R = H

(2) R = OH

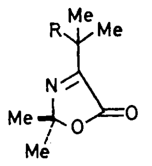

(3) R = H

(4) R = OH


(5)


(6) R = Ac, X = Cl

(7) R = Et, X = BF_4


(8) $R = MeO_2C{\cdot}C(CHO)Cl{\cdot}S$

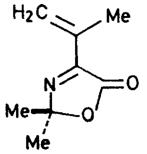
(9) $R = MeO_2C{\cdot}C(:CHOMe){\cdot}S$

(10) $R = MeO_2C{\cdot}CH(Cl){\cdot}S$

(11) $R = MeO_2C{\cdot}CH(OAc){\cdot}S$

(12) $R = MeO_2C{\cdot}CH_2{\cdot}S$

(13) $R = MeO_2C{\cdot}CH_2SO$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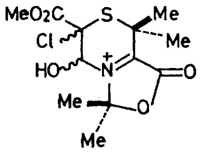
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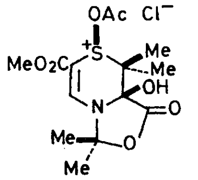
(16)

In support of the proposed structure, derivative (**8**) gave the enol ether (**9**)† (59%), m.p. 85—86°, when treated with triphenylphosphine followed by diazomethane. Deformylation occurred when the aldehyde (**8**) was left in the presence of triethylamine; the derived chloro-ester (**10**)† (89%) afforded the acetoxy-ester (**11**)† (55%), m.p. 112—114°, with silver(I) perchlorate in acetic acid, and the methylene-derivative (**12**)† (23%) with zinc in acetic acid. Oxidation of compound (**12**) with *m*-chloroperbenzoic acid yielded the sulphoxide (**13**)† (38%), m.p. 85—87°, which underwent the expected thermolysis[5] in boiling benzene to give the olefin (**14**)† (45%).

The racemate of the hydroxy-lactone sulphoxide (**2**) was converted into the 3-oxazolin-5-one (**8**) (98%) by acetyl chloride (3 mol. equiv.) in acetonitrile, indicating that it was the precursor of the chloride (**8**). This transformation probably occurs by way of species (**15**), formed from the acetoxysulphonium salt (**16**) by a Pummerer-type reaction and a 1,3-shift of the hydroxy-group. There is some analogy for this behaviour in the reactions of methyl 3,4-dihydro-3-hydroxymethyl-2*H*-1,4-thiazine-6-carboxylate 1-oxides with acetyl chloride.[6]

The ready aerial oxidation of the lactone sulphoxide (**1**) to the hydroxy-lactone sulphoxide (**2**) is unusual. No reaction occurred in the absence of acetyl chloride suggesting that the acetoxysulphonium salt (**6**) was the species which underwent the electron transfer.

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† The composition of new compounds was confirmed by elemental analysis and/or by mass spectroscopy. Structural arrangements were supported by i.r., u.v., and n.m.r. spectroscopic evidence.

[1] W. Steglich, *Fortschr. Chem. Forsch.*, 1969, **12**, 77.

[2] A. G. W. Baxter, J. Kitchin, R. J. Stoodley, and R. B. Wilkins, *J.C.S. Chem. Comm.*, 1973, 285.

[3] R. J. Stoodley and R. B. Wilkins, *J.C.S. Perkin I*, 1974, 1572.

[4] G. V. Kaiser, R. D. G. Cooper, R. E. Koehler, C. F. Murphy, J. A. Webber, I. G. Wright, and E. M. Van Heyningen, *J. Org. Chem.*, 1970, **35**, 2430.

[5] C. A. Kingsbury and D. J. Cram, *J. Amer. Chem. Soc.*, 1960, **82**, 1810.

[6] J. Kitchin and R. J. Stoodley, *J.C.S. Chem. Comm.*, 1972, 959; *J.C.S. Perkin I*, 1973, 22, 2464.