

## LETTERS TO THE EDITOR

### HETEROCYCLES WITH A BRIDGE NITROGEN ATOM.

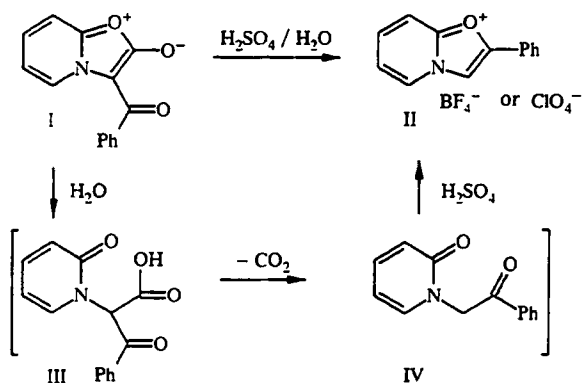
#### 7.\* NOVEL SYNTHESIS OF THE OXAZOLO[3,2-*a*]PYRIDINIUM CATION BY RECYCLIZATION OF A MESOIONIC PRECURSOR: CONFIRMATION OF A COMPUTER PREDICTION

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Mesoionic heterocycles as a rule are unstable. The atypical stable mesoionic 2-oxo derivatives of oxazolo[3,2-*a*]pyridine (especially their 3-acyl-substituted derivatives [2, 3], easily obtained by cyclization of (2-oxo-1-pyridyl)acetic acid on treatment with acid halides) have been studied in the most detail. A characteristic feature of this subclass of mesoionic systems is the occurrence of reactions of facile opening of the oxazole ring when treated with N- and O-containing nucleophiles. Thus on boiling in water, 2-oxo-3-acyloxazolo[3,2-*a*]pyridines are converted to N-(β-oxoalkyl)-2-pyridones. Obviously the sequence of the reactions of formation and hydrolytic cleavage of the indicated mesoionic structures allows us to consider them as stable cyclic intermediates in the conversion of hetarylacetic acid to hetarylketone (a variation of the Dakin–West reaction to the amino acid series [4]).

In an earlier report [5], the high lability of mesoionic oxazolopyridines relative to nucleophiles served as the basis for the hypothesis that previously unknown recyclizations might be possible for this class. Based on this hypothesis and using the GREH computer program [6], we did a combinatorial sort of promising but as yet unstudied recyclizations, and a number of predictions have already been confirmed experimentally [1]. One of the computer predictions (Scheme (8) in [5]) allowed us to expect a previously unknown "one-pot" recyclization of mesoionic 2-oxo-3-acyloxazolo[3,2-*a*]pyridines to oxazolo[3,2-*a*]pyridinium cations through intermediate formation of N-(β-oxoalkyl)-2-pyridone. In this report, this reaction has been actually observed experimentally.

We found that when water is added to a solution of 2-oxo-3-benzoyloxazolo[3,2-*a*]pyridine (I) in conc. H<sub>2</sub>SO<sub>4</sub> and then the mixture is treated with HClO<sub>4</sub> or HBF<sub>4</sub> solution, the 2-phenyloxazolo[3,2-*a*]pyridinium salt (II) is formed in good yield.



\*For communication 6 see [1].

A few drops of water were carefully added with stirring to a solution of 0.5 mmoles of mesoionic compound I in 3 ml conc.  $\text{H}_2\text{SO}_4$ ; rapid evolution of gas occurred. The solution was allowed to stand for 24 h at  $20^\circ\text{C}$  and then poured into 60 ml water. A solution of 70%  $\text{HClO}_4$  was added to the transparent solution dropwise until precipitation was complete. After standing for 24 h, the precipitate was separated. Oxazolopyridinium perchlorate II was obtained (yield 88%; after recrystallization from methanol, 65%), identical in properties (mp [7], PMR spectrum [8]) to a known sample. When the perchloric acid is replaced by  $\text{HBF}_4$ , the tetrafluoroborate cation II is isolated (80%), the PMR spectrum of which in  $\text{DMSO-D}_6$  (400 MHz) was identical to the spectrum of the perchlorate. The starting mesoionic compound I was synthesized according to the technique described in [2].

The reaction probably occurs through a stage of sequential breaking of the  $\text{C}_{(2)}-\text{O}$  bond (due to water molecule acting as a nucleophile), acid decarboxylation of the  $\beta$ -ketoacid residue in the intermediate III with formation of *N*-phenacylpyridone IV, which also undergoes final cyclocondensation and dehydration to cation II in sulfuric acid. (Cyclization of IV-II is well known in the literature [7, 8].)

As we see, the mutually exclusive water and dehydrating agent prove to be simultaneous reagents. In this connection, we note that alternative methods for carrying out the recyclization (holding or boiling in dilute or concentrated sulfuric acid) or a different order of mixing of the reagents do not result in occurrence of the reaction, and only violation of the usual safety rule ("pour acid into water") leads to the desired conversion.

Oxazolopyridinium cations which can be obtained by such a method in turn have a tendency to undergo new recyclizations when treated with C-, N-, S-containing nucleophiles with formation of indolizines and other bridged azolopyridines (see the earlier reports in the series [1, 5]). The I-II conversion discovered thus serves as a prototype for the first stage for recyclization sequences which are very rare in heterocyclic synthesis, according to the principle of tandem recyclizations of the type mesoionic structure-cation-other heterocycles.

A somewhat unexpected result was the impossibility of accomplishing an analogous "one-pot" conversion for the 2-oxo-3-(*p*-nitrobenzoyl)oxazolo[3,2-*a*]pyridine described in the literature [2], which has very low solubility. In this case, when water is added to a sulfuric acid solution of the mesoionic compound, only reprecipitation of the starting material occurs, and the use of dilute acid (causing partial opening of the ring and decarboxylation) proves to be insufficient for final cyclocondensation. The overall conversion nevertheless can be accomplished through stages of isolation of the intermediate *N*-(*p*-nitrophenacyl)-2-pyridone and followed by its cyclization.

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