

FORMATION OF β -ACYLAMINO ENAMINES IN THE REACTION OF
3,4-DIPHENYL-4-OXAZOLIN-2-ONE WITH SECONDARY AMINES^(°,°°)

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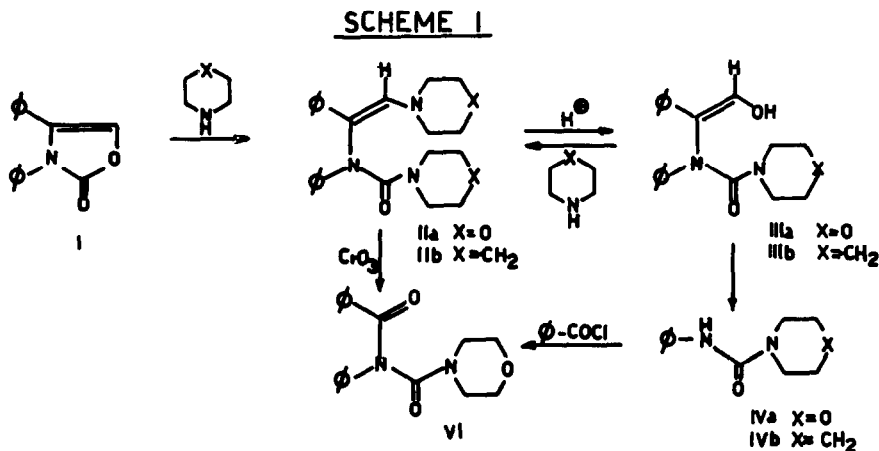
4-Oxazolin-2-ones have hitherto been described as unreactive compounds (1). However, it was recently reported (2) that 4-oxazolin-2-ones bearing no substituent at the 5 position are unusually reactive towards a series of reagents: e.g. 3,4-diphenyl-4-oxazolin-2-one (I, Scheme I) reacts with primary amines to give 5-hydroxyimidazolidin-2-ones in very good yields. We wish to report herein some observations on the reaction of I with secondary amines.

When a solution of I in benzene and excess morpholine was refluxed using a water separator, there was formed in 60% yield a colourless crystalline compound (°°°), m.p.

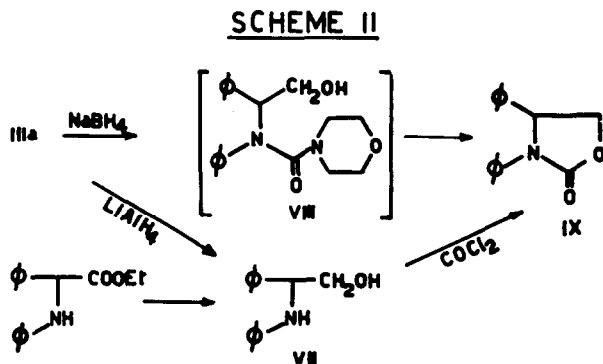
(°) "Reactions of 3,4-Disubstituted 4-Oxazolin-2-ones"
part II. For part I see ref. 2.

(°°) Dedicated to Prof. R.de Fazi on his 75th birthday.

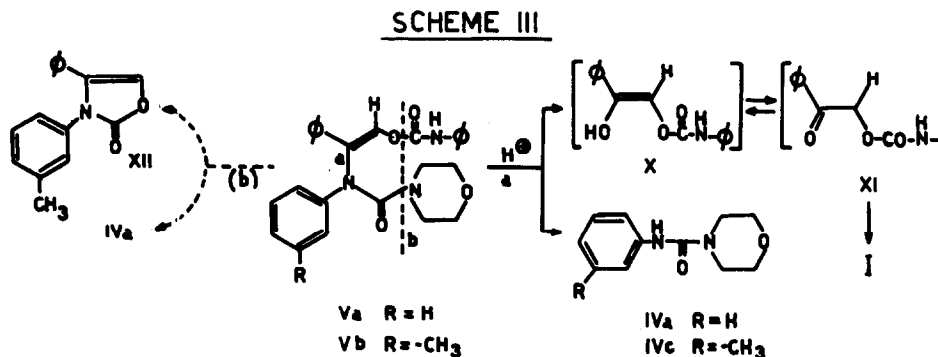
(°°°) Melting points were obtained on a Kofler hot stage and are not corrected. Satisfactory analyses were obtained for all compounds described herein.



179-181°, to which the structure of β -(4-morpholino)- α -[N-(4-morpholinocarbonyl)anilino]styrene (IIa) was assigned on the following ground. Oxidation of IIa with sodium dichromate in benzene-acetic acid gave 4-(N-benzoylcarbanil)morpholine (VI, m.p. 149-151°), also independently prepared from 4-morpholinecarboxanilide (IVa) and benzoyl chloride in pyridine. Hydrolysis of IIa with 10% hydrochloric acid at room temperature produced in 80% yield a stable compound, m.p. 141-143°, for which analytical and spectral data [λ_{OH} 3.25, λ_{CO} 6.15 μ ; N.M.R. (CDCl₃) two signals at 5.25 (1H, singlet) and 9.92 δ (1H, singlet)] suggest the enolic structure IIIa. Hydrolysis of this compound with hot hydrochloric acid afforded IVa [m.p. 162-163°; Lit.(3), m.p. 161.5-162°] in quantitative yield. Treatment of IIIa with morpholine produced again IIa in good yield. Reduction of IIIa with lithium aluminium hydride afforded oily β -anilinophenethyl alcohol (VII, Scheme II), also independently prepared from ethyl α -anilinophenylacetate, and characterized as the picrate, m.p. 135-137°. Treatment of IIIa with alkaline sodium borohydride produced, probably through the intermediate VIII, a 55% yield of 3,4-diphenyloxazolidin-2-one (IX, m.p. 129-130°), whose structure was confirmed by synthesis from VII and phosgene.



Compound IIIa reacted with phenyl isocyanate to give the carbanilate Va (Scheme III, m.p. 155-157°, λ_{CO} 5.70, 6.10 μ), which was neatly hydrolyzed by hydrochloric acid at room temperature into IVa and I. The formation of these products could take place through two different pathways: normal enamine hydrolysis of bond a to give IVa and X, followed by cyclization of the latter to I, through XI, or a double cleavage as indicated by the dotted line b, which could lead to the same products. The second, less likely hypothesis, was however disproved as follows. Hydrolysis of the carbanilate Vb (m.p. 143-145°), obtained from 3-m-tolyl-4-phenyl-4-oxazolin-2-one (XII, m.p. 113-114°) through the usual reaction sequence, afforded I and 4-(m-methylcarbonyl)morpholine (IVc, m.p. 124-125°, also independently prepared from 4-morpholinecarbonyl chloride and m-toluidine), and not IVa and XII. A separate experiment proved, on the other hand, that XI cyclized quantitatively to I under the reaction conditions.



Interaction between I and piperidine produced, in analogy with the reaction with morpholine, the enamine IIb (m.p. 106-109°), whose stepwise hydrolysis afforded the enolic enamide IIIb (m.p. 133-135°) and 1-piperidinecarboxanilide [IVb, m.p. 167-169°; Lit.(4), m.p. 168°]. The piperidine enamine IIb and the enolic enamide IIIb are somewhat less stable than the corresponding morpholine derivatives.

Compounds such as IIa/b represent a novel type of structure, for which the denomination β -acylamino enamines seems most appropriate. Since 5 unsubstituted 4-oxazolin-2-ones can easily be prepared from α -hydroxyketones of the type R-CO-CH₂OH (such as phenacyl alcohol), the reactions described herein can be regarded as a new method for converting the latter structures to enamine-like compounds. Work is in progress to test on II and III some typical reactions of enamines.

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REFERENCES

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