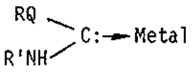
NEW HETEROCYCLE SYNTHESES BY METAL ISONITRILE COMPLEXES —— PREPARATION OF 2-UNSUBSTITUTED OXAZOLINE, OXAZINE, IMIDAZOLINE AND IMIDAZOLONE

Yoshihiko Ito, Yoshinori Inubushi, and Takeo Saegusa
Department of Synthetic Chemistry, Kyoto University
Yoshida, Kyoto, 606

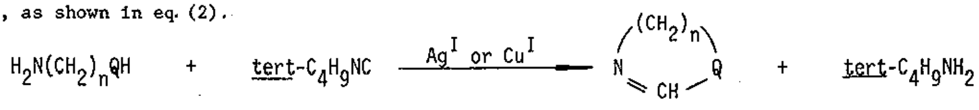
We reported that isonitrile with Cu, Ag and Au metal compound catalysts is inserted into heteroatom hydrogen linkages of amine, alcohol, thiol, phosphine and silane producing the corresponding formimidoyl derivatives in high yields eq. (1),

$$\mathrm{RQH} + \mathrm{R'NC} \xrightarrow{\text{Metal}} \mathrm{RQCH{=}NR'} \qquad (1)$$

Recently, intermediacy of carbene-coordinated metal complex 1 has been established for these isonitrile insertion reactions. Here, new heterocycle syntheses based on the isonitrile insertion are reported. β- and γ-Amino alcohols were reacted with tert-butyl isocyanide in the presence of silver or copper salt to produce 2-oxazoline 2a and dihydro-1,3-oxazine 2b, respectively, in good yields, as shown in eq. (2).



1



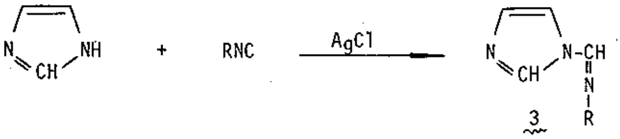
a : Q=O, n=2 b : Q=O, n=3 c : Q=NH, n=2 d : Q=S, n=2

2

(2)

Similarly, the reaction of diamine and aminothiol with isocyanide afforded the corresponding heterocycles (2c and 2d), in high yields.

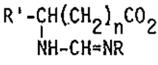
The isonitrile insertion of imidazole could be accomplished by means of AgCl catalyst to produce 1-(N-alkyliminoformyl)imidazole 3 in moderate yields.



3

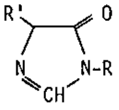
(3)

Compounds 3 are conveniently utilized as a reagent of the transfer reaction of an N-alkyliminoformyl group to amine, alcohol and the so-called active methylene compound. The transformimidoylation of 3 with amino acids produced N-(N'-alkyliminoformyl)amino acids 4 in moderate yields. The products of α- and β-N-(N'-alkyliminoformyl)amino acids were readily cyclized by the treatment with acetic anhydride in pyridine to give 1-alkyl-2-imidazolin-5-one 5 and 3-alkyl-5,6-dihydro-4-pyrimidinone 6, respectively.

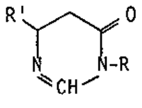


$$\begin{array}{l}\mathrm{R'{-}CH(CH_2)_nCO_2H}\\ \quad\mathrm{NH{-}CH{=}NR}\end{array}$$

4



5



6