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1,4-ADDITION REACTIONS OF 4-(m-NITROBENZYLIDENE)-3,5-DIMETHYLISOPYRAZOLE

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Reactions of 4-(m-nitrobenzylidene)-3,5-dimethylisopyrazole(II) with hydrochloric acid in methanol, acetic anhydride, acetic acid, benzoyl chloride and dimethyl sulfate gave the 1,4-addition products(III, IV, V, VIII, and IX) in fairly good yields.

We reported previously[1] the reactions of o-substituted benzylideneacetylacetones with hydrazine dihydrochloride in methanol or acetonitrile gave 4-(α-methoxy-o-substituted benzyl)-3,5-dimethylpyrazoles and 4-(o-substituted benzylidene)-3,5-dimethylisopyrazoles, which was proposed to exist in a betain form based on its nmr data (the C_3- and C_5-methyl group showed the signal as singlet). Though only few papers[2] have been published on isopyrazole, there is no report[3] on the isopyrazole derivatives possessing an exo-double bond at C_4. We wish to report here some reactivities of 4-(m-nitrobenzylidene)-3,5-dimethylisopyrazole(II)[mp 205-206°; both C_3- and C_5-methyl group appeared as singlet at δ(DMSO-d_6) 2.05], prepared from m-nitrobenzylideneacetylacetone(I).

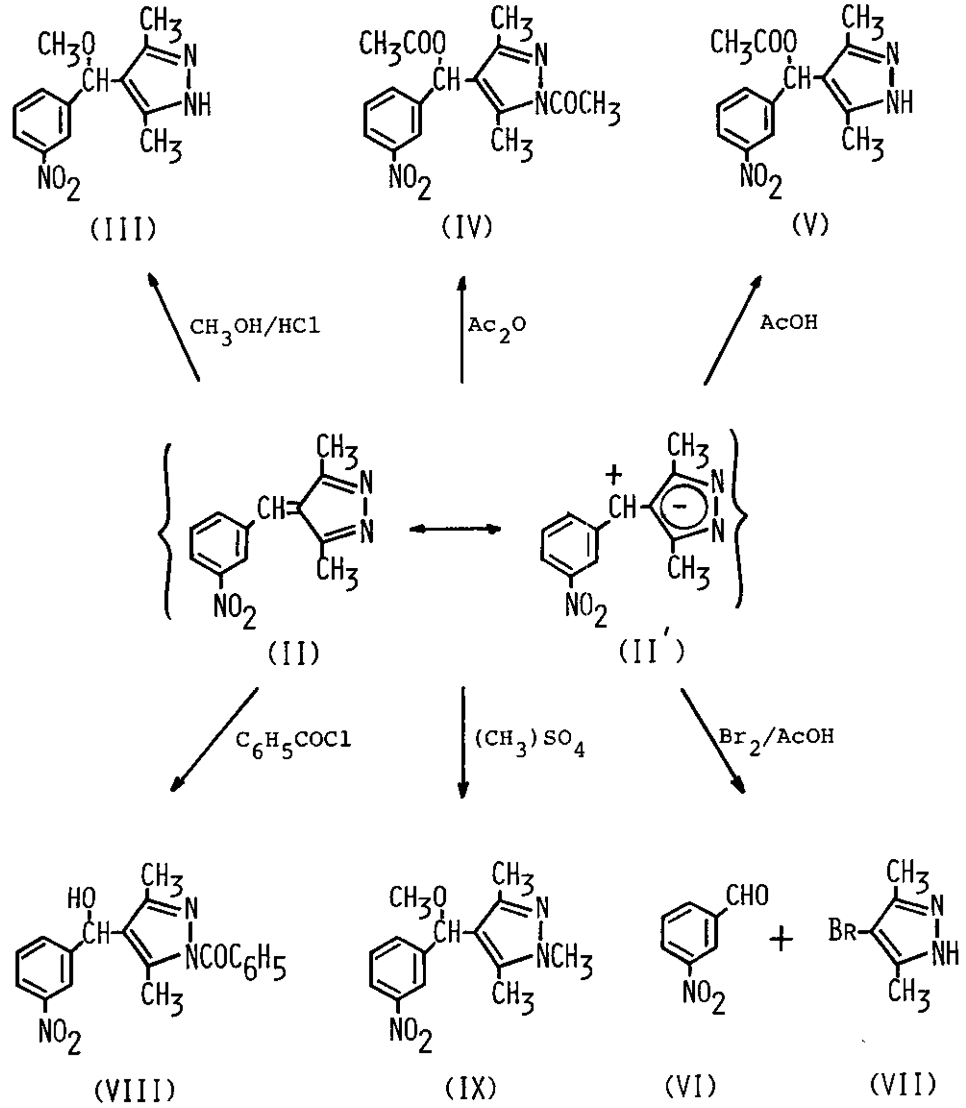
Reaction of II with catalytic amount of hydrochloric acid in methanol followed by neutralization gave a 90% yield of 4-(α-methoxy-*m*-nitrobenzyl)-3,5-dimethylpyrazole(III)[M^+ 261; $\delta(CDCl_3)$ 2.20(6H, s), 3.38(3H, s), 5.38(1H, s), 9.58(1H, bs), which is also obtained by condensation of I with hydrazine dihydrochloride in methanol[1].

Treatment of II with acetic anhydride or acetic acid at 70° gave a 92% yield of 1-acetyl-4-(α-acetoxy-*m*-nitrobenzyl)-3,5-dimethylpyrazole(IV)[M^+ 331; $\nu_{max}^{CHCl_3}$ 1732 and 1730 cm^{-1}; $\delta(CDCl_3)$ 2.10, 2.21, 2.60 and 2.63(each 3H; each s)] or 4-(α-acetoxy-*m*-nitrobenzyl)-3,5-dimethylpyrazole(V) as oil, whose structural assignment was based on its ir(NH band at 3460 cm^{-1}) and nmr data. The isopyrazole II was treated with bromine in acetic acid at room temperature to give a mixture of *m*-nitrobenzaldehyde(VI) and 4-bromo-3,5-dimethylpyrazole(VII), presumably *via* V[1].

Reaction of II with benzoyl chloride in pyridine followed by treatment with ice water gave a 90% yield of 1-benzoyl-4-(α-hydroxy-*m*-nitrobenzyl)-3,5-dimethylpyrazole(VIII)[ν_{max}^{KBr} 3400 and 1720 cm^{-1}; $\delta(CDCl_3)$ 2.01 and 2.63(each 3H, each s), 3.00 and 5.91(each 1H, each bs)].

It is interesting to note that treatment of II in absolute toluene with dimethyl sulfate under reflux in less than 0.5 h gave a 25% yield of 4-(α-methoxy-*m*-nitrobenzyl)-1,3,5-trimethylpyrazole (IX)[M^+ 275; $\delta(CDCl_3)$ 2.11, 2.15, 3.38 and 3.75(each 3H, each s), 5.35(1H, s)].

The above results point out that only the 1,4-addition products were isolated, not the 1,2-addition product.


(III)
(IV)
(V)
CH$_3$OH/HCl
Ac$_2$O
AcOH
(II)
(II′)
C$_6$H$_5$COCl
(CH$_3$)SO$_4$
Br$_2$/AcOH
(VIII)
(IX)
(VI)
(VII)

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