

SYNTHESIS OF A NOVEL RING SYSTEM:

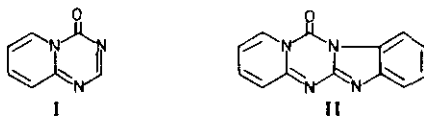
6H-BENZIMIDAZO[1,2-a]PYRIDO[2,1-d][1,3,5]TRIAZIN-6-ONE

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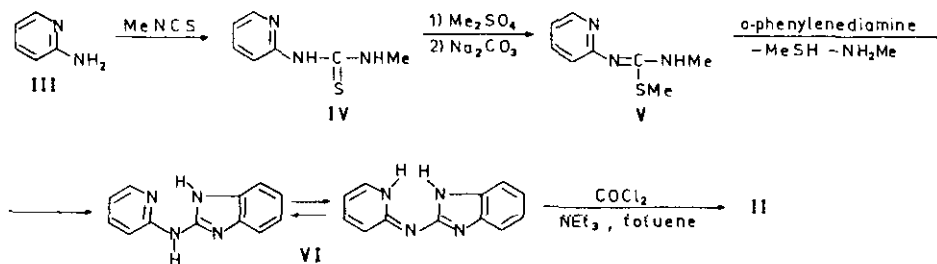
Abstract- Methyl N-methyl-N'-(2-pyridyl)carbamimidothioate (V) on
fusion with *o*-phenylenediamine gave 2-(benzimidazol-2-ylamino)-
pyridine (VI) which on treatment with phosgene underwent a ring-
closure reaction to give the title compound.

Previously¹ it was reported the synthesis of some derivatives of 4H-pyrido[1,2-a]-
[1,3,5]triazin-4-one (I).



Since our interest is focused on the synthesis of heterocyclic systems having fused
imidazole or benzimidazole rings²⁻⁴, we decided to attempt the synthesis of 6H-ben-
zimidazo[1,2-a]pyrido[2,1-d][1,3,5]triazin-6-one (II) in which the triazinone ring
of I is fused with a benzimidazole ring. The synthesis was carried out following
the synthetic route described in Scheme 1.

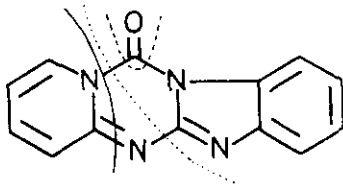
Scheme 1



N-Methyl-N'-(2-pyridyl)thiourea, obtained from 2-aminopyridine and methyl isothiocyanate, was converted into methyl N-methyl-N'-(2-pyridyl)carbamimidothioate (V) on treatment with dimethyl sulphate and sodium carbonate. Compound V on fusion with *o*-phenylenediamine according to Deck and Dains⁵ gave 2-(benzimidazol-2-ylamino)pyridine (VI) which reacted very easily, under mild conditions, with phosgene to give the title compound in almost quantitative yield.

The structure of II was confirmed by means of its ir and mass spectra⁶. In fact its ir spectrum shows a peak at about 1740 cm⁻¹ attributable to an ureidic carbonyl group. Furthermore, in the mass spectrum of II are detectable the fragment ions: |M|⁺ m/z 236, |M-CO|⁺ m/z 208, |Benzimidazole+CO|⁺ m/z 144, |Py|⁺ m/z 78 which agree with the assigned structure (see Scheme 2).

Scheme 2



EXPERIMENTAL

Unless otherwise stated, melting points were obtained in open capillary tubes and are uncorrected. The ir and mass spectra were recorded with a Perkin-Elmer 283 spectrophotometer and a Kratos MS 80 instrument respectively.

N-Methyl-N'-(2-pyridyl)thiourea (IV)

This compound (IV) was prepared following the method reported in the literature⁷.

Methyl N-methyl-N'-(2-pyridyl)carbamimidothioate (V)

A solution of IV (16.7g, 100mmoles) and dimethyl sulphate (12.6g, 100mmoles) in acetone was refluxed for 3h. Removal of the solvent left a residue which was dissolved in water. The above described solution was treated with dilute sodium carbonate until the pH was 9.5 and then extracted with chloroform. Evaporation of the dried chloroform solution left the crude V (14g, 77.5% yield) as a viscous colourless syrup which did not crystallize after standing for several days. Attempts to purify this compound were unsuccessful.

By adding a saturated solution of sodium perchlorate to a solution of V in 6N hydrochloric acid the perchlorate salt of V separated out. Mp 168-169 °C.

Anal. Calcd. for C₈H₁₁N₃S.HClO₄: C, 34.11; H, 4.29; N, 14.91. Found: C, 34.06;

H, 4.20; N, 14.84.

2-(Benzimidazol-2-ylamino)pyridine (VI)
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A mixture of the crude V (14g, 77.5mmoles) and *o*-phenylenediamine (8.37g, 77.5 mmoles) was heated at 160 °C for 45 min. The residue was treated with a little hot ethanol and filtered. The collected 2-(benzimidazol-2-ylamino)pyridine (VI) amounted to 11.35g (69.6% yield), mp 253-254 °C from DMF/ethanol; ir(potassium bromide): 3270, 1550  $\text{cm}^{-1}$ .

Anal. Calcd. for  $\text{C}_{12}\text{H}_{10}\text{N}_4$ : C, 68.56; H, 4.79; N, 26.65. Found: C, 68.46; H, 4.86; N, 26.68.

6H-Benzimidazo[1,2-a]pyrido[2,1-d][1,3,5]triazin-6-one (II)  
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A solution of phosgene (4.75g, 48mmoles) in toluene was slowly added to a well-stirred suspension of VI (10.1g, 48mmoles) and triethylamine (9.71g, 96mmoles) in dry toluene, maintaining the temperature at 0 °C. The resulting mixture was allowed to react at room temperature for 6h, and then filtered. The collected solid was washed with ether, then with water, and dried. The yield of II was almost quantitative. Mp 327 °C(Kofler hot stage apparatus) from DMF; ir(potassium bromide): 1745 cm^{-1} ; ms(60 eV): $|\text{M}|^+$ m/z 236, $|\text{M-CO}|^+$ m/z 208, $|\text{M-CON}|^+$ m/z 194, $|\text{Benzimidazole+CO}|^+$ m/z 144, $|\text{Benzene+N}|^+$ m/z 90, $|\text{Py}|^+$ m/z 78, $|\text{C}_4\text{H}_4|^+$ m/z 52.

Anal. Calcd. for $\text{C}_{13}\text{H}_8\text{N}_4\text{O}$: C, 66.10; H, 3.41; N, 23.72. Found: C, 66.05; H, 3.44; N, 23.72.

ACKNOWLEDGEMENT

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