

Reaction of Azines with Nitriles

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A new method for the synthesis of the hydrazine derivatives (**3**) by reaction of azines with nitriles is described; the hydrolysis of (**3**) yields the 3*H*-pyrazolo[1,5-*a*]pyrimidines (**4**).

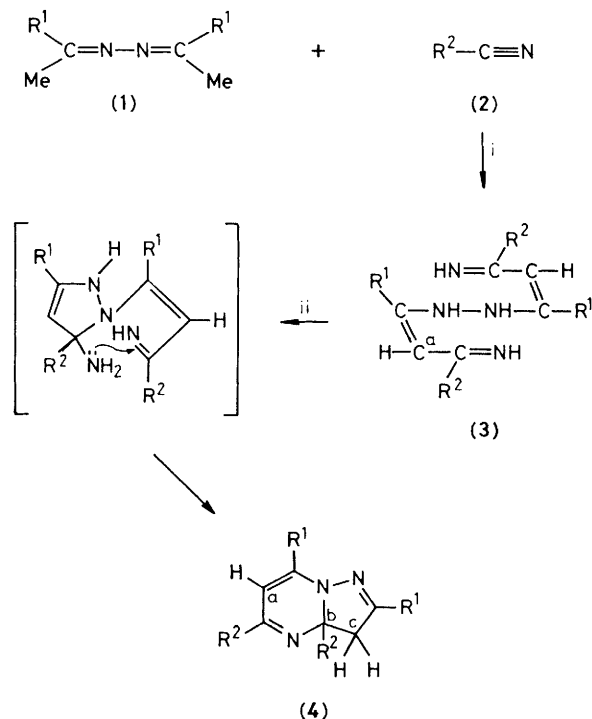
Imines react with saturated nitriles in the presence of AlCl_3 to give 1-azabutadiene derivatives,¹ which are useful in the syn-

thesis of five- and six-membered heterocyclic rings.² In order to produce suitable starting materials for the synthesis of

Table 1. Hydrazine derivatives (3) and 3*H*-pyrazolo[1,5-*a*]pyrimidines (4) obtained from azines.

| | R ¹ | R ² | % Yield (3) | m.p./°C | % Yield (4) | m.p./°C | Carbon-13 chemical shifts and multiplicities | | | |
|---|---|---|----------------|---------|----------------|---------|--|-------------------------------|---------------------------|---------------------------|
| | | | | | | | δ C ^a (3) (p.p.m.) | δ C ^a (4) (p.p.m.) | δ C ^b (p.p.m.) | δ C ^c (p.p.m.) |
| a | Me | Ph | 69 | 190–191 | 73 | 110–112 | 96.22(d) | 94.56(d) | 82.39(s) | 55.97(t) |
| b | Me | <i>p</i> -MeC ₆ H ₄ | 72 | 213–216 | 78 | 119–121 | 95.63(d) | 94.76(d) | 82.62(s) | 56.39(t) |
| c | Ph | Ph | 85 | 185–186 | 81 | 190–191 | 93.86(d) | 98.78(d) | 83.61(s) | 52.94(t) |
| d | <i>p</i> -ClC ₆ H ₄ | Ph | 82 | 204–205 | 79 | 206–208 | 94.24(d) | 98.27(d) | 82.89(s) | 52.90(t) |
| e | Me | cyclohexyl | 77 | 188–191 | | | 92.52(d) | | | |
| f | Et | Ph | 70 | 169–171 | | | 94.42(d) | | | |

more complex heterocycles we investigated the reactions of the azines (1) with the saturated nitriles (2) in the presence of

**Scheme 1.** Reagents: i, lithium di-isopropylamide; ii, H_3O^+ .

lithium di-isopropylamide (LDA) (Scheme 1).[†] Typically, (1) (0.01 mol) in diethyl ether or tetrahydrofuran was added to LDA (0.022 mol). After 20 min the mixture was cooled to -78°C and (2) (0.02 mol) was added. The mixture was warmed to room temperature with stirring and then hydrolysed with water. The compounds (3), obtained regioselectively and in excellent yields, were extracted with diethyl ether and purified by recrystallization in hexane–chloroform. 3*H*-Pyrazolo[1,5-*a*]pyrimidines (4) were obtained by hydrolysis of (3) with 2*M* H_2SO_4 at room temperature, and were purified by recrystallization in hexane. The results of the syntheses are summarized in Table 1.[‡]

Structures (3) and (4) were verified by elemental analysis, i.e., ^1H n.m.r. and mass spectroscopy. In addition these compounds displayed characteristic signals in their ^{13}C n.m.r. spectra. The proton-coupled spectrum of (3) contains a doublet centred at δ 93–96 p.p.m. and of (4) a doublet at δ 94–98, a singlet at δ 82–83, and a triplet at δ 54–56 p.p.m.

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References

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[†] Compounds (1) and (2) do not react in the presence of AlCl_3 .

[‡] When $R^1 = \text{Et}$, the addition through the $\text{C}(\alpha)\text{--H}$ of the methyl group only is observed.