

Reisert Compound Studies: The First Pyridine Reisert Compound

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Treatment of pyridine with trimethylsilyl cyanide, benzoyl chloride, and aluminium chloride in methylene chloride gave 1-benzoyl-2-cyano-1,2-dihydropyridine, providing the first example of a pyridine Reisert compound; several 3-substituted pyridines have also been converted to Reisert compounds.

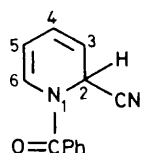
Although Reisert compounds¹ have been prepared from quinoline, isoquinoline, and a large number of other aromatic nitrogen heterocyclic systems, no report has appeared on the formation of a Reisert compound from pyridine. The failure of pyridine to form a Reisert compound was first noted in an early review² and has been a topic of concern since that time.^{1,3} Reisert analogues (**2**) have been obtained in the pyridine series.^{3,4}

We now report the first synthesis of 1-benzoyl-2-cyano-1,2-dihydropyridine [(**1**), the pyridine Reisert compound] and

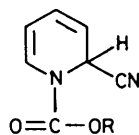
some related Reisert compounds. In a general procedure, pyridine (0.01 mol), benzoyl chloride (0.015 mol), trimethylsilyl cyanide (0.015 mol), and anhydrous aluminium chloride (0.03 g) were stirred under nitrogen in anhydrous methylene chloride (40 ml) at room temperature for 24 h. The methylene chloride solution was washed, dried, and evaporated to give a mixture containing the Reisert compound. Although the yield of (**1**) in this mixture is low (0.5–3.5%) it can be easily separated from the benzoyl cyanide (80%) by removal of the latter compound through sublimation.

Thus pyridine and benzoyl chloride gave (**1**), (0.5–3.5%), i.r. (KBr) ν_{CO} 1680 cm^{-1} , m.p. 104–105 °C, ¹H n.m.r. (CDCl₃) δ 7.50 (m, 5H, Ph), 6.52 (d, *J* 7.8 Hz, 1H, 6-H), 6.26 (dd, *J* 9.6 and 5.4 Hz, 1H, 4-H), 6.00 (d, *J* 5.4 Hz, 1H, 2-H), 5.67 (m, 1H, 3-H or 5-H), 5.46 (m, 1H, 3-H or 5-H); *m/z* 210.0798 (*M*⁺, 4.9%), 184 (0.3), 131 (31.4), 130 (0.8), 105 (100), 104 (0.8), 79 (38), 105 (100), 104 (0.8), 79 (38). Similar Reisert compounds were also obtained from pyridine and *p*-anisoyl and *p*-toluoyl chlorides, but not from *p*-nitrobenzoyl chloride. Several 3-substituted pyridines also gave Reisert compounds (**3**). Thus 3-acetylpyridine and benzoyl chloride gave (**3a**) (30–45%), i.r. (KBr) ν_{CO} 1645, 1665 cm^{-1} , m.p. 154–155 °C, ¹H n.m.r. (CDCl₃) δ 7.52 (m, 5H, Ph), 7.18 (d, *J* 6.0 Hz, 1H, 6-H), 6.92 (dd, *J* 7.8 and 1.8 Hz, 1H, 4-H), 6.53 (d, *J* 1.8 Hz, 1H, 2-H), 5.71 (dd, *J* 7.8 and 6.0 Hz, 1H, 5-H), 2.44 (s, 3H, Me); *m/z* 252.0898 (*M*⁺, 1.4%), 226 (1.5), 147 (2.8), 146 (0.7), 131 (8.5), 130 (0.4), 121 (7.5), 105 (100).

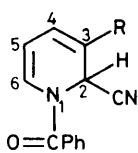
Methyl nicotinate gave (**3b**) (16%), m.p. 95–96 °C, *m/z* 268.0853 (*M*⁺, 3.4%). 3-Cyanopyridine gave (**3c**), (13%), m.p. 151–153 °C, *m/z* 235.0753 (*M*⁺, 1.7%) and a small amount of gum believed to be (**4**). All compounds gave correct



(1)



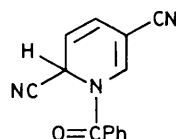
(2)



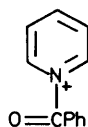
(3a), R = COMe

(3b), R = CO₂Me

(3c), R = CN



(4)



(5)

elemental analyses and spectra for the assigned structures [the n.m.r. spectrum of (1) is similar to that reported^{3,4} for (2)]. Acid hydrolysis gave benzaldehyde¹ as identified by its 2,4-dinitrophenylhydrazone derivative. As is typical for Reissert compounds, no cyano band was observed in the i.r. spectra. The low yield of the pyridine Reissert compound and the accompanying high yield of benzoyl cyanide can be accounted for by the preferential attack of cyanide at the carbonyl group rather than the 2-position of (5). Despite the low yield these compounds can be conveniently obtained and we are continuing to study the formation and reactions of

pyridine Reissert compounds and the pyridine Reissert analogues.

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