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Reisert Compound Studies. IX.

2-(N,N-Diphenylcarbamoyl)-1,2-dihydroisoquinaldonitrile (1,2)

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The preparation of Reisert compounds (4) (I and II) from a wide variety of quinolines (5) or isoquinolines (6), potassium cyanide and an acyl chloride (7), acyl bromide (7), or acid anhydride (7) is a well known reaction. Recently we reported (1) a similar reaction of isoquinoline, potassium cyanide, and sulfonyl chlorides to give compounds of the type III. We have now observed that a similar reaction occurs with isoquinoline, potassium cyanide and N,N-diphenylcarbamoyl chloride to give compound IV. Use of N,N-diethylcarbamoyl chloride also gave a similar compound V although in much poorer yield. Use of quinoline, potassium cyanide and N,N-diphenylcarbamoyl chloride gave a nearly quantitative recovery of the carbamoyl chloride. It may be recalled (1) that with potassium cyanide and sulfonyl chlorides, quinoline gave quinaldonitrile.

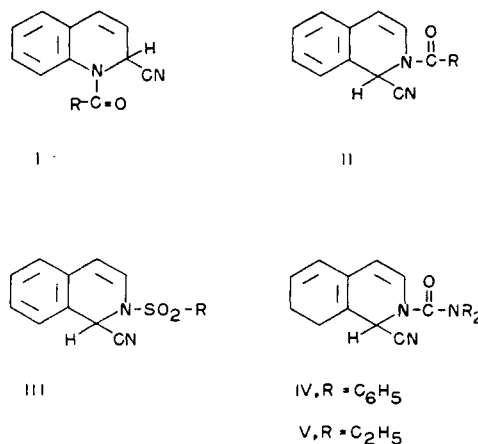
The infrared spectra of IV and V had carbonyl peaks (potassium bromide pellet) at 1640 and 1650 cm^{-1} respectively and as is the case (3) with Reisert compounds I and II the analogues did not show any nitrile absorption in the infrared. As is the case with II and III, the NMR of IV was consistent with the structure indicated.

As might be expected 2-(N,N-diphenylcarbamoyl)-1,2-dihydroisoquinaldonitrile (IV) proved to be considerably more stable than the normal Reisert compounds (I and II) or the sulfur compounds (III). When IV was refluxed for 18 hours with concentrated hydrochloric acid or heated with 50% sodium hydroxide for one hour no reaction took place. This is in contrast to the facile acid-catalyzed hydrolysis of Reisert compounds to aldehydes (3) and the conversion of II to isoquinoline on heating with 50% sodium hydroxide. Under similar conditions III gives rise to isoquinoline (acid) and isoquinaldonitrile (base) (1).

EXPERIMENTAL

2-(N,N-Diphenylcarbamoyl)-1,2-dihydroisoquinaldonitrile (IV).

A solution of 14.4 g. (0.062 mole) of diphenylcarbamoyl chloride in 35 ml. of methylene chloride was added dropwise over two hours to a stirred mixture of 4.0 g. (0.031 mole) of isoquinoline in 40 ml. of methylene chloride and 6.2 g. (0.094 mole) of potassium cyanide



in 16 ml. of water. After stirring for 20 hours, the mixture was filtered to give 3.5 g. of solid, m.p. 220°. The filtrate was washed with water, 10% hydrochloric acid, water, 5% sodium hydroxide, water and evaporated to yield a solid which was recrystallized from 95% ethanol to give 3.5 g. of solid, m.p. 215-219°. The combined solids (64% yield) were recrystallized from 95% ethanol to give white crystals, m.p. 218-219°.

Anal. Calcd. for $\text{C}_{23}\text{H}_{17}\text{N}_3\text{O}$: C, 78.61; H, 4.88; N, 11.96. Found: C, 78.57; H, 5.04; N, 11.96.

2-(N,N-Diethylcarbamoyl)-1,2-dihydroisoquinaldonitrile (V).

In a similar manner isoquinoline, potassium cyanide, and N,N-diethylcarbamoyl chloride gave a 2.5% yield of solid, m.p. 100-102° (from 95% ethanol).

Anal. Calcd. for $\text{C}_{15}\text{H}_{17}\text{N}_3\text{O}$: C, 70.56; H, 6.71; N, 16.46. Found: C, 70.52; H, 6.65; N, 16.60.

Hydrolysis of Isoquinoline Reisert Compound (II, R = C_6H_5).

A mixture of 1 g. of II (R = C_6H_5) and 15 ml. of 50% sodium hydroxide solution was heated at 100° for 10 minutes with occasional stirring. The reaction mixture was diluted with water and extracted with ether. Concentration of the ether extract gave an oil which dissolved in 20 ml. of ethanol and treated with alcoholic picric acid solution to yield isoquinoline picrate, m.p. 224-226° alone and on mixing with an authentic sample.

REFERENCES

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