DIRECT AMINATION OF AROMATIC ALDEHYDES DURING ACETYLENIC SYNTHESIS. D.C. Ayres and R.B. Chater.

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We have explored the reaction between oxybenzaldehydes and acetylene as a route to labelled precursors in cinnamate biogenesis and for models in biogenetic-type synthesis. In the preparation of 1-(3'-methoxy-4'benzyloxyphenyl)-prop-2-ynol (I 41% yield, m.p. 84.5°, found: C, 75.9; H,6.2%. $C_{17}H_{16}O_2$ requires C,76.1; H,6.0%) from benzylvanillin (1), it was found that yields were reduced in liquid ammonia when excess sodamide was present. The further reaction between (I) and benzylvanillin was not possible,



although O-benzyl-2-aminovanillin (II), was isolated in 26% yield from this experiment-

The acetylenic alcohol (I, 2.6g, 0.01 mole) in tetrahydrofuran (20 ml, sodium-dried) was added to sodamide (from 1711 sodium; 0.46g, 0.02 g. atom) in liquid ammonia (ca 100 ml), followed ten minutes later by benzylvanillin (2.4g., 0.01 mole) in tetrahydrofuran (20 ml). Next morning, the mixture was treated with ammonium chloride in the usual way and the dry (MgSO₄) chloroform extract yielded an oil from which 2-aminobenzylvanillin separated (m.p. 188.5° from ethanol, found: C, 69.7; H, 6.0; N, 5.2. $C_{15}H_{15}O_3N$ requires C, 70.0; H, 6.0; N, 5.1%).

Hydrogenolysis for 1 hour of the benzyl ether in ethanolic solution using palladium/charcoal at ambient temperature afforded a quantitative yield of 2-aminovanillin (2), m.p. 148° (from ethanol). The difference in the m.p. from that (129°) previously recorded (2) may be due to solvation or polymorphism. The infrared spectrum (KBr disc) was identical to that published (3) save for minor differences in the range 1100-1300 cm⁻¹, which were also found in nujol.

The mass spectrum further characterised O-benzyl-2aminovanillin, which gave rise to a molecular ion of 257 (relative intensity 3.7) and included fragments at m/e 256 (18.5) and 91 (base peak).

The orientation of the inserted-NH₂ group was established by the p.m.r. spectra. The methylene protons of the benzyl ether resonated at $\oint 4.82$ in solution in hexadeuteriodimethyl sulphoxide; part of the low field region was obscured by the large peak due to the phenyl group ($\oint = 2.56$) but a double t($\oint = 2.87$) typical of an ortho-coupling (II, $J_{H_aH_b} = 9.5H_z$) could be distinguished. In the debenzylated compound H_a appeared at $\oint 3.12$, $J_{H_aH_b} = 8.5H_z$. A sharp peak at $\oint 0.45$ was eliminated on addition of deuterium oxide and must result from acidic protons; the aldehydic resonance was unaffected by exchange and overlay the low field part ($\oint = 2.47$) of the H_b doublet.

It is difficult to detect these amino-aldehydes by testing with mineral acids as they then react to form insoluble anils (4); the amination may have gone unremarked for this reason. The determination of the mechanism of the reaction requires further experiment, but it seems most probable that an intermediate complex III is formed, wherein negative charge is stabilised mesomerically by the carbonyl group and inductively by oxysubstituents (5).

When the rate of amination is competitive with that of alkinylation, as in the attempted further reaction of I, **a** further side-reaction will follow between the acetylide and the formed amine (6).

In view of the difficulties of making aminoaldehydes the synthetic possibilities of the new reaction are being explored. In reference experiments conducted under the same conditions as the ethinylation, in the absence of sodium acetylide, piperonal and benzylvanillin afforded the amines in 35% yield. The concurrent formation of appreciable amounts of the anils was to be expected as warming aminoaldehydes in solvent with added catalyst will effect this change (7).

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