β-PHENETHYLAMINES. THE CATALYTIC HYDROGENATION OF ω-NITROSTYRENES

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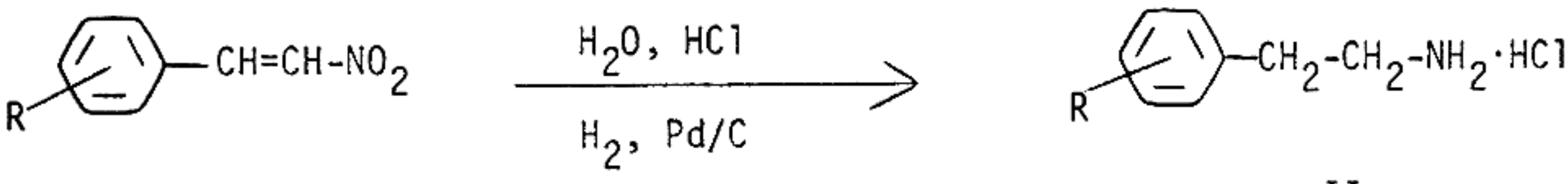
ABSTRACT

Good yields of β-phenethylamine hydrochloride salts are obtained directly from the catalytic reduction of α,β-unsaturated nitro compounds in dilute hydrochloric acid.



I II

Reduction of ω-nitrostyrenes (I) is a simple route to the important β-phenethylamines (II). Lithium aluminum hydride has been used successfully for this transformation.[1,2,3] While this reagent is admirably suited for small-scale reactions, it is impractical for bulk preparative work because of the hazards inherent in the use of large quantitites of this relatively expensive metal hydride and the difficult work-up procedures. In view of these objections, the hydrogenation of I would appear to be a more desirable procedure. This has already been done indirectly, via the oxime, in poor over-all yield,[4,5] and directly in highly acidic solution.[6,7] While good yields are reported under the latter conditions, the work-up is tedious.

We now wish to report a simple, efficient, and inexpensive method of converting I to II. This procedure, which involves the palladium catalyzed hydrogenation of I suspended in dilute hydrochloric acid[8], is general and gives good yields of II as the hydrochloride salt. A typical procedure is given in the Experimental Section and several examples are listed in Table I.

Experimental

General Procedure. - To a suspension of x g. of an ω-nitrostyrene in x ml. of conc. hydrochloric acid is added ca. 0.2-0.3x g. of 10% Pd-C catalyst and enough water to make the ω-nitrostyrene comprise 5-7% of the mixture. Reduction is carried out at 50-80° under 500-1500 p.s.i. of hydrogen in an agitated autoclave. Removal of the catalyst, evaporation of the filtrate, and trituration of the residue with acetone normally affords the hydrochloride salt of the β-phenethylamine pure enough for further use. In rare cases, when the hydrogenation filtrate is not colorless because of impurities in the ω-nitrostyrene, the aqueous filtrate is extracted with an immiscible organic solvent prior to evaporation.

β-(3,4-Methylenedioxy)phenethylamine hydrochloride. - A rocking autoclave was charged with 207 g. (1.07 mol) of 3,4-methylenedioxy-β-nitrostyrene,[9] 207 ml. of conc. hydrochloric acid, 65 g. of 10% Pd-C and the total volume was adjusted to 3.5 l. by the addition of water. The mixture was hydrogenated at 55° and an initial pressure of 800 p.s.i. until there was no further uptake, ca. 4 hours. After cooling, the catalyst was removed and the colorless filtrate was evaporated to dryness under reduced pressure. Benzene was added to the residue and the evaporation was repeated to remove

traces of water. The white, solid, residual 3,4-methylenedioxyphenethylamine hydrochloride, after trituration with three 250 ml. portions of acetone and drying at 70° in a vacuum oven, weighed 153 g. (71%); m.p. 212-214°.[10]

The β-phenethylamine hydrochlorides listed in Table I were prepared by this procedure from the corresponding ω-nitrostyrenes.

TABLE I

β-Phenethylamine Hydrochlorides (II·HCl)

R	M.P.,°	Yield,%
3-OH	133-5[11]	84[a]
3-OMe	147-8[12]	80[a]
3-OH, 4-OMe	154-6[3,b]	76[b]
3-OMe, 4-OH	212-4[3]	82[a]
$2,5\text{-(OMe)}_2$	138-40[6]	55[a]
$2,4,5\text{-(OMe)}_3$	186-7[13]	72[a]
$3,4,5\text{-(OMe)}_3$	181-3[2]	83[c]

a - Recrystallized; b - as free base; c - not recrystallized

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8. The first example of this procedure was the preparation of 4-hydroxy-3-methoxyphenethylamine reported by A. Brossi, J. Van Burik, and S. Teitel, Helv. Chim. Acta, 51, 1978 (1968) prior to the development of the general procedure herein reported.

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