Preparation of Isomeric Trifluoromethylbenzylamines

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The hydrogenation of 2-, 3-, and 4-trifluoromethylbenzonitriles to the corresponding trifluoromethylbenzylamines is described. Some physical constants of these new compounds and of their hydrochloride salts are reported.

THERE IS virtually no information about the isomeric trifluoromethylbenzylamines in the literature.[1] The availability of the isomeric trifluoromethylbenzonitriles led the authors to hydrogenate them to provide some knowledge about the preparation and properties of these substituted benzylamines.

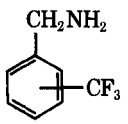
Reduction of various nitriles in the presence of rhodium catalyst and excess ammonia gave good yields of primary amine and a minimum of secondary amine (1). Benzonitrile, which was not included in that study, was used as a model before attempting conversion of the trifluoromethyl compounds. In this instance 60% of benzylamine and 30% of dibenzylamine were obtained from the rhodium catalyzed reduction. Hydrogenation in alcoholic hydrogen chloride in the presence of a 30–40% ratio of 5% palladium on carbon gave mostly primary amine. This procedure, when applied to the isomeric trifluoromethylbenzonitriles, resulted in 60–80% yields of the corresponding benzylamines. Uptake of hydrogen was rapid except with the 2-substituted product which required 24 hr. for complete reduction, probably because of steric effects.

EXPERIMENTAL

4 - Trifluoromethylbenzylamine.—A solution of 17.1 Gm. (0.1 mole) of 4-trifluoromethylbenzonitrile[2] in 200 ml. of ethyl alcohol containing 0.3 mole of hydrogen chloride (or an equivalent amount of concentrated hydrochloric acid) was hydrogenated under 2 Atm. pressure in the presence of 6.0 Gm. of 5% palladium on carbon. Uptake was complete in less than 1 hr. The solution was filtered from the catalyst and concentrated to complete dryness under reduced pressure. The hydrochloride salt was treated with anhydrous ether and filtered; yield 80%. In another run the base was obtained by the following procedure.

In the preparation of the 2- and 3-substituted benzylamines the solid mass was dissolved in water. The solution was made basic with 40% sodium hydroxide solution. The base, after extraction with ether and drying, was fractionated. The salts of these two amines were prepared from the distilled bases. (See Table I.)

TABLE I



CF_3	Yield, %	B.p., °C.	Constants, mm.	n_D^{25}	Hydrochloride, m.p., °C.	Formula	Anal.[a] Calcd.	Found
2[b]	68.5	108–110	64	1.4673		$C_8H_8F_3N$	C, 54.85	C, 54.72
							H, 4.60	H, 4.34
							N, 7.99	N, 8.18
					286–288	$C_8H_9ClF_3N$	C, 45.40	C, 45.48
							H, 4.28	H, 4.58
							N, 6.62	N, 6.55
3[c]	56	93–97	28	1.4613		$C_8H_8F_3N$	C, 54.85	C, 55.09
							H, 4.60	H, 4.43
							N, 7.99	N, 8.01
					178–80	$C_8H_9ClF_3N$	C, 45.40	C, 45.39
							H, 4.28	H, 4.44
							N, 6.62	N, 6.76
4	62	114–120	50–52	1.4630		$C_8H_8F_3N$	C, 54.85	C, 54.86
							H, 4.60	H, 4.35
							N, 7.99	N, 8.17
					194–198[d]	$C_8H_9ClF_3N$	C, 45.40	C, 45.21
							H, 4.28	H, 4.49
							N, 6.62	N, 6.72

[a] Microanalyses by Mr. O. F. Kolsto and his associates of this laboratory. [b] Uptake of hydrogen complete in 24 hr. [c] Uptake of hydrogen complete in 2 hr., with a 32% ratio of catalyst to compound. [d] Disappears from capillary tube.

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[1] Pavlath, A. E., and Leffler, A. E., "Aromatic Fluorine Compounds," Reinhold Publishing Co., New York, N. Y., 1962, p. 438, lists only the *meta* isomer (641 and 643*a*) without a reference, physical data, or method of preparation.

[2] The isomeric trifluoromethylbenzonitriles were purchased from Pierce Chemical Co., Rockford, Ill.

REFERENCE

(1) Freifelder, M., *J. Am. Chem. Soc.*, **82**, 2386(1960).