REINVESTIGATION OF THE REACTION OF N,N-DIMETHYL- 3-METHYLBENZENAMINE WITH PYRIDINE IN THE PRESENCE OF BENZOYL CHLORIDE

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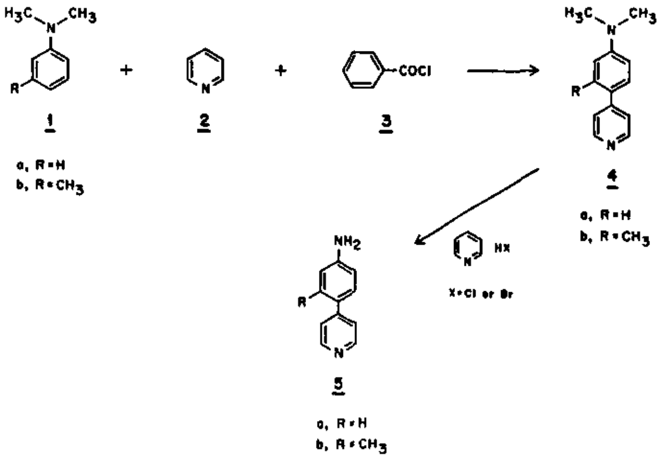
Abstract - The reaction of N,N-dimethyl-3-methylbenzenamine with pyridine in the presence of benzoyl chloride gave N,N-dimethyl-3-methyl-4-(4-pyridinyl)benzenamine which was demethylated with pyridine hydrobromide to afford 3-methyl-4-(4-pyridinyl)benzenamine.

3-Methyl-4-(4-pyridinyl)benzenamine (5b) was needed in one of the projects in our laboratory. The 4-(4-pyridinyl)benzenamine (5a) which is a des-methyl analog of 5b was prepared by coupling N,N-dimethylbenzenamine with pyridine in the presence of benzoyl chloride[1] followed by demethylation with pyridine hydrochloride[2]. However, the same authors[1] were unsuccessful in obtaining N,N-dimethyl-3-methyl-4-(4-pyridinyl)benzenamine (4b) from the reaction of N,N-dimethyl-3-methylbenzenamine with pyridine and benzoyl chloride under similar conditions[1]. Since this method is short and convenient, we thought it worthwhile to investigate it. By changing the molar ratio of the reactants and prolonging the reaction time, we obtained N,N-dimethyl-3-methyl-4-(4-pyridinyl)benzenamine (4b) in 10% yield. Demethylation of 4b with pyridine hydrobromide gave 3-methyl-4-(4-pyridinyl)benzenamine (5b).



EXPERIMENTAL

N, N-Dimethyl-3-methyl-4-(4-pyridinyl)benzenamine (4b)A mixture of 120 g (1.5 mol) of pyridine, 210 g (1.5 mol) of benzoyl chloride and 5 g of copper powder was heated on a steam bath for 1 h and was then treated with N,N-dimethyl-3-methylbenzenamine over a period of 30 min. The resulting dark brown mixture was stirred and heated on a steam bath for 22 h and then stirred into 500 ml of 14% aqueous sodium hydroxide solution. After 1 h, the black oily material was extracted with 1 l of ether. The ethereal extract thus obtained was extracted with 500 ml of 14% aqueous hydrochloric acid. The ether layer was discarded and the aqueous layer was made basic by adding aqueous ammonia. The black viscous oil that separated was chromatographed on silica gel using ether as the eluent. The fraction that gave a bluish fluorescent spot under uv was collected and crystallized from ether-hexane to give 23.4 g (10%) of yellow flakes; mp 108-110 °C; ms: M^+ at m/e 212 ($C_{14}H_{16}N_2$); ^{1}H-NMR ($CDCl_3$): δ 8.58-6.64 (7 H, aromatic), 2.99 (s, 6H, $-N(CH_3)_2$), 2.33 (s, 3H, aryl CH_3). Anal. Calcd for $C_{14}H_{16}N_2$: C, 79.21; H, 7.60; N, 13.20. Found: C, 79.37;H, 7.54; N, 13.24.

3-Methyl-4-(4-pyridinyl)benzenamine (5b). To a stirred solution of 800 ml of 48% aqueous hydrobromic acid was added 112 g (0.53 mol) of 4b in small portions in 20 min and then 470 ml of pyridine was added dropwise in 40 min. The resulting solution was heated to 210-215°C (internal temperature) allowing water to distill. The melt was heated at the above mentioned temperature for 10 h, cooled to room temperature, and then neutralized with 35% aqueous sodium hydroxide solution. The yellow precipitate was filtered, washed with water, dried and recrystallized as a dihydrochloride salt to give 113.7 g (83%) of a yellow solid; mp 288-290 °C (dec.); ms: M^+ at m/e 184 ($C_{12}H_{12}N_2$); ^{1}H-NMR(CF_3COOD): δ 11.6 (4H, exchanged), 9.2-7.4 (7H, aromatic), 2.5 (s, 3H aryl CH_3). *Anal. calcd. for* $C_{12}H_{12}N_2$.2HCl: C, 56.05, H, 5.49; N, 10.89. Found: C, 56.01;H, 5.54;N, 11.11.

REFERENCES

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