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PREPARATION OF 2-CHLORO- AND 2-AMINO-5-BENZOYLBENZIMIDAZOLES

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We found that the presence of ammonium chloride in a particular ratio provided a clean product in high yield, which can be used further without recrystallization.

The reactivity of 2-chloro-benzimidazoles has been discussed by Harrison and Ralph.¹⁰ The resistance of the 2-chlorobenzimidazoles, unsubstituted at the 1 or 3 position has been explained by the formation of a stable anion in the presence of a base. Direct conversion of 1 to 2 was made possible by using a pressure reaction, more or less similar to the method reported by Kym and Ratner¹¹ for the preparation of 2-amino-5-nitrobenzimidazole. In our experiments the best results were achieved by heating 1 with liquid ammonia in a steel tube at 135-40° for five hours. The product 2 was obtained in high yield.

EXPERIMENTAL SECTION

Melting points are uncorrected. IR spectra were recorded on a Perkin-Elmer spectrophotometer. NMR spectra were obtained with a Varian T-60 spectrometer, using Me₄Si as an internal standard. Mass spectral analyses were conducted using an AEI MS 30 double beam mass spectrometer or CEC 21-11013 spectrometer. Thin layer chromatography (TLC) was carried out on plates of silica gel using chloroform:methanol (9:1) as a solvent system and iodine vapour exposure for visualization of the components. Compound 3 was prepared by known methods starting from o-phenylenediamine and urea,² followed by benzylation.³

2-Chloro-5-benzoylbenzimidazole (1).- A suspension of 3 (24 g 0.1 mole) and ammonium chloride (12 g, 0.22 mole) in phosphorous oxychloride (170 ml) was refluxed for 15-16 hrs. The excess of phosphorous oxychloride was distilled using a water pump and the residue was treated with ice-cold water with stirring. The solid product was collected and washed with water and sodium carbonate solution (saturated) until the

filtrate was neutral. The product (1) on recrystallization from methanol-ethyl acetate melted at 188-190° (24 g, 93% yield).

IR (Nujol): 3150, 1660, 720 cm^{-1} . NMR (Pyridine- d_5): δ 7.4-8.2 (m, 8H, aromatic), 10.5 (s, 1H, -NH). MS: 256 M^+ .

Anal. Calcd. for $\text{C}_{14}\text{H}_9\text{ClN}_2\text{O}$: C, 65.49; H, 3.50; N, 10.91;

Cl, 13.84; Found: C, 65.73; H, 3.60; N, 10.70; Cl, 13.68

2-Amino-5-benzoylbenzimidazole (2).- Compound 1 (5 g, 0.02 mole) was placed in a steel tube (\sim 100 ml capacity) which was cooled in Dry Ice-acetone mixture or liquid nitrogen. Approximately 30 ml of liquid ammonia was condensed by cooling ammonia gas in a bubbler, in a Dry Ice-acetone mixture bath. The liquid ammonia was added to the previously cooled steel tube and the tube was tightly closed immediately. The steel tube containing the reaction mixture was heated in an oven at 135-140° for 5 hrs. The excess ammonia gas was slowly released from the bomb after cooling. The residue was dissolved in methanol (50 ml) and refluxed for 1 hr to convert the product hydrochloride, if any, back to the base. The methanol was evaporated to dryness to get a dark brownish red residue. The product (2) was homogeneous on TLC and a pale yellow crystalline compound was obtained after passing through a short column of silica gel (using CHCl_3 and CHCl_3 : MeOH, 9.7:0.3) mp. 175-177°, lit.⁴ mp. 174-176°. IR(Nujol): 3200, 1650 cm^{-1} . NMR(DMSO- d_6): δ 7.3-7.8 (NH, NH_2 -protons merged with the aromatic H). MS: m/e relative intensity (%): 237, 100, M^+ ; 160.56, M^+ - C_6H_5 , 132.6, M^+ - $\text{C}_6\text{H}_5\text{CO}$; 105, 10, $\text{C}_6\text{H}_5\text{CO}^+$.

Anal. Calcd. for $C_{14}H_{11}N_3O$: C, 70.88; H, 4.64; N, 17.72

Found: C, 70.85; H, 4.81; N, 17.54

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REFERENCES

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1. R. Rastogi and S. Sharma, *Synthesis*, 861 (1983).
2. S. M. Mistry and P. C. Guha, *J. Ind. Chem. Soc.*, 7, 793 (1930).
3. Yu. A. Rozin, E. P. Darienko and Z. V. Pushkareva, *Chem. Heter. Compds.*, 4, 510 (1968); *C.A.*, 70, 37720f (1969).
4. J. H. Wikel, C. J. Paget, D. C. DeLong, J. D. Nelson, C. Y. E. Wu, J. W. Paschal, A. Dinner, R. J. Templeton, M. O. Chaney, N. D. Jones and J. W. Chamberlin, *J. Med. Chem.*, 23, 368 (1980).
5. *The Merck Index*, 10th Ed., 5589 (1983).
6. A. Ricci and P. Vivarelli, *Gazz. Chim. Ital.*, 97, 750 (1967); *C.A.*, 67, 108597 x (1967).
7. S. A. Agripat Neth. Appl. 6,611,087 (1967); *C.A.*, 68: P 29699 z (1968).
8. D. Harrison, J. T. Ralph and A. C. B. Smith, *J. Chem. Soc.*, 2930 (1963).
9. U. S. Borax and Chemical Corp. *Brit.* 1,015,937 (1966); *C.A.*, 64: 9734h (1966).
10. D. Harrison and J. T. Ralph, *J. Chem. Soc.*, 236 (1965); *ibid.*, 3132 (1965).
11. O. Kym and L. Ratner, *Ber.*, 45, 3238 (1912).

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