Synthesis of Oxindole, A Five Membered Nitrogen Containing Heterocyclic Compound from Azepine, A Seven Membered Nitrogen Containing Heterocyclic Compound

Dr. Manoj Kumar
Department of Chemistry,
B.R.A.Bihar University, Muzaffarpur

Abstract : Synthesis of oxindole, a five membered nitrogen containing heterocyclic compound from azepine, a seven membered nitrogen containing heterocyclic compound was done in the laboratory by standard method given in the experimental section. Chemicals used in the synthesis were of laboratory grade. Spectral and analytical data confirms the structure of the product.

Index Terms **- Oxindole, Azepine, Heterocyclic, Laboratory, Spectral.**

I. INTRODUCTION

Heterocyclic chemistry is immensely fascinating in the sense that heterocyclic compounds undergoes reactions of wide range. Ring transformation reactions of heterocyclic compounds look quite alluring. Recently such ring transformation reactions have been subject of great attention. In the present work, I have transformed a seven membered lactam [D] through ring contraction into a five membered oxindole [E] and [F]. The synthetic approach and analytical data is discussed in the experimental section.

II. EXPERIMENTAL SECTION

Chemicals used in the synthesis were of laboratory grade. The melting points were determined in a sulphuric acid both in open capillaries and are uncorrected. An electrically operated melting points apparatus was used to determine melting point of some high melting compounds. Drying and purification of solvents was done as per prescribed methods.

[A] Synthesis of 7-methoxy, 4-carboxytetralone-1

A mixture of 11grams (0.05mole) of α[p-methoxy phenyl]glutaric anhydride and 30 grams of polyphoric acid was heated to 100-110°C and kept at that temperature for 5minutes. Another 30 grams of polyphosphoric acid was added and the mixture was heated for 10 minutes at the same temperature. The product which separated after the addition of ice and water was collected dried and recrystallized from benzene yield 8grams (0.036mole), 80% M.P.97-98°.

Analysis
Molecular Formula : $C_{12}H_{12}O_4$, %C = 65.38, %H = 5.48, %O = 29.10.
IR(KBr) : 1715, 2860, 2350 and 1580 cm^{-1}.
NMR : 6.7(multiplets, 3H), 3.5(singlets,3H), 6.2(singlets,1H), 5.7(triplets, 2H), 5.4(triplets,1H), 9.2(singlets,1H).

[B] Synthesis of 7-methoxy, 4-carbomethoxy tetralone-1

A solution of 10grams (0.040 mole) 7-methoxy, 4-carboxy tetralone-1 in 100ml of methanol was chilled, saturated with hydrogen chloride and allowed to stand overnight at room temperature. The residue remaining after removal of the methanol was taken up in the ether and the solution was washed with 5% potassium carbonate solution and with water and dried. The ether was removed and the residue was distilled at reduced pressure to yield [B] as colorless oil. B.P. 138°C. The potassium carbonate extracts afforded 0.53grams (5%) of unreacted 4-carboxy tetralone-1.

Analysis
Molecular Formula : $C_{12}H_{14}O_4$, %C = 66.62, %H = 5.88, %O = 27.30.
IR(KBr) : 1715, 2860, 1575 and 3455 cm^{-1}.
NMR : 6.8(multiplets, 3H), 3.5(singlets, 3H), 5.8(triplets, 2H), 5.32(quartets, 2H), 5.3(triplets, 1H), 4.1(triplets, 3H).

[C] Synthesis of 7-methoxy, 4-carbomethoxy tetralone-1, Oxime

A mixture of 5.5grams (0.023mole) of ketoester [B], 5.5grams (0.079mole) of hydroxylamine hydrochloride, 30ml of dry pyridine and 30 mole of absolute methanol was refluxed for 2 hours. The solvent was evaporated and the oily residue was saturated with cold water until crystallization occurred. The oxime [C] was collected and the crystallized from methanol.

Analysis:
Molecular Formula: $C_{13}H_{15}O_4N$, %C = 62.61, %H = 6.01, %N = 5.56.
IR(KBr) : 1715, 2850, 1960 and 1580 cm^{-1}.
NMR : 6.7(multiplets, 3H), 3.5(singlets, 3H), 5.7(triplets, 2H), 5.2(triplets, 2H), 5.3(triplets, 1H), 3.5(triplets,3H), 5.9(singlets, 1H).

[D] Synthesis of 2-Oxo, 5-carbomethoxy 8-methoxy2, 3, 4, 5-tetrahydrobenzoazepine

A mixture of 5grams (0.02mole) of oxime [C] and 150 grams of polyphosphoric acid was stirred manually and heated to 110°C, the temperature maintained for 5 minutes. Higher temperature about 125°C sharply decreased the yield. The mixture was cooled and treated with ice product was extracted with chloroform. The solvent was removed and the residue was crystallized from ether to yield 4.6 grams (0.018). Lactam [D] was 92%. M.P. 141-144°C.

Analysis:
Molecular Formula : $C_{13}H_{15}O_4N$, %C = 62.61, %H = 6.01, %N = 5.56.
IR (KBr) : 3430, 2860, 1700 and 1520 cm^{-1}.
NMR : 6.5(multiplets, 3H), 3.5(singlets,3H), 6.1(triplets,1H), 5.1(triplets,2H), 5.3(triplets,1H), 4.7(triplets,3H), 5.5(triplets, 2H).

[E] Synthesis of 6-methoxy methyl oxindole3-propionate

A solution of 1.51grams (0.006mole) of lactam [D] in 100ml of dry methanol containing 2-3 drops of concentrated HCl was refluxed for 10 hours. The solvent was removed and the residue was dissolved in benzene. The solution was washed in usual way and dried. Removal of the benzene gave a colorless product which was crystallized from benzenepentane, M.P 57.5-59°C was recorded.

Analysis:
Molecular Formula: $C_{13}H_{15}O_4N$, %C = 62.25, %H = 6.01, %N = 5.59.
IR(KBr) : 3580, 2860, 1750, 1720 and 1520 cm^{-1}.
NMR : 6.7(multiplets, 3H), 3.5(singlets, 3H), 6.2(singlets,1H), 5.7(triplets,1H), 5.5(quartets,2H), 6.2(triplets,2H), 9.2(singlets, 3H).

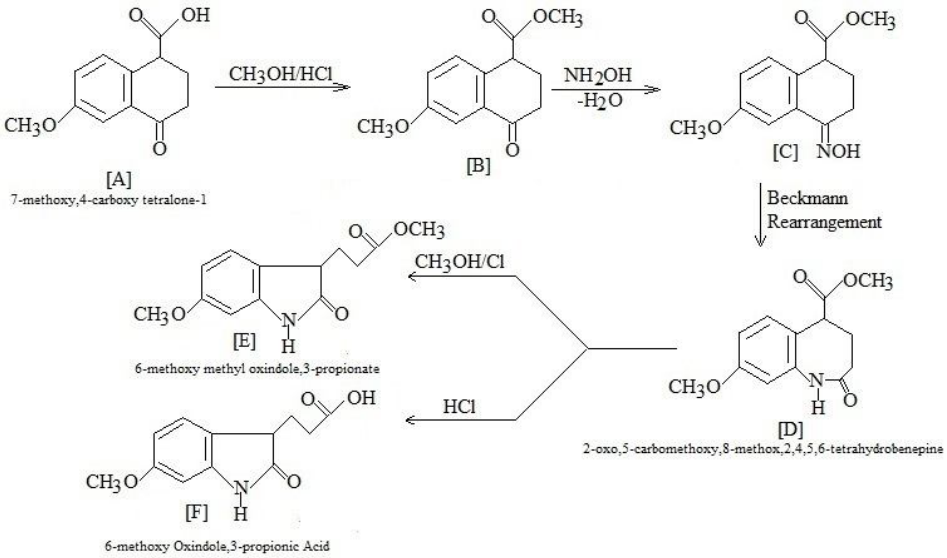
[F] Synthesis of 6-methoxy oxindole 3-propionic acid

A solution of 2.35grams (0.0094mole) lactam [D] in 25ml of concentrated HCl was refluxed for 3 hours and then for 3 hours followed by 12 hours at room temperature. The product which crystallized from the solution was removed by filteration and washed with acetone ether to yield 2.28grams (0.009mole)of acid [F], M.P. 161-165°C.

Analysis :
Molecular Formula : $C_{12}H_{13}O_4N$, %C = 61.35, %H = 5.63, %N = 7.29.
IR(KBr) : 3600, 3550, 2860, 1720, 1580 and 1590 cm^{-1}.
NMR : 6.7(multiplets, 3H), 3.5(singlets, 3H), 6.2(singlets,1H), 5.7(triplets,1H), 5.5(quartets,2H), 6.2(triplets,2H), 9.2(singlets, 3H).

III. Results and Discussion

Analytical and spectral data confirms the compound [E] and [F] is nitrogen containing five membered heterocyclic compounds which was transformed from seven membered nitrogen containing heterocyclic compound.



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