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New Approach of Indole Synthesis - A Boom

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ABSTRACT

Indoles, both naturally occurring and synthetic, exhibit wide-ranging biological activity. Unusual and complex molecular architectures occur among their natural derivatives. As a result, this important ring system continues to attract attention from the international chemical community, and new methodologies for the construction of this ever relevant heteroaromatic ring continue to be developed. Unfortunately, many methods frequently start from ortho-substituted anilines, thereby greatly restricting the availability of starting materials. A more general approach would start from a mono-functionalized arene such as an aniline or halobenzene, followed by cyclization with C–C or C–N bond formation to an inactivated C–H bond. Such methods are the subject of this perspective. Indole efficiently synthesized by using different Lewis acids like HCl, H_2SO_4, $ZnCl_2$, PCL_5.

Keywords : Hetero Aromatic, Mono-Functionalized Arene

I. INTRODUCTION

Heterocyclic chemistry is one of the most valuable sources of novel compounds with diverse biological activity, mainly because of the unique ability of the resulting compounds to mimic the structure of peptides and to bind reversibly to proteins. Indole is an aromatic heterocyclic organic compound with formula C8H7N. It has a bicyclic structure, consisting of a six-membered benzene ring fused to a five-membered pyrrole ring. Indole is widely distributed in the natural environment and can be produced by a variety of bacteria. As an intercellular signal molecule, indole regulates various aspects of bacterial physiology, including spore formation, plasmid stability, resistance to drugs, biofilm formation, and virulence. The amino acid tryptophan is an indole derivative and the precursor of the neurotransmitter serotonin. Macrocyclic heterocyclic chemistry is one of the upcoming research areas in the chemical science. Macrocyclic compounds continue to attract significant attention due to their numerous possible applications particularly in the areas like medicine, catalysis and industry. This article summarizes the synthetic developments in Indole based heterocyclic compounds. To medicinal chemists, the true utility of heterocyclic structures is the ability to synthesized by different ways which are studied in this present research work which play an important part in new ways of synthesis.

II. METHODS AND MATERIAL

The routine procedure has been used for study of Fisher Indole synthesis and modification carried out in different aspects.

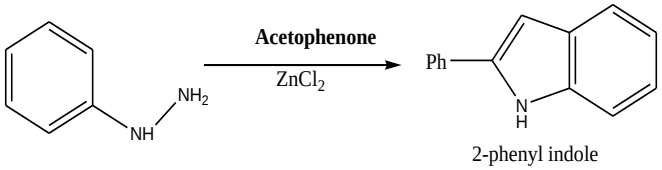
1. Routine method of Indole synthesis:

Prepare 1gm acetophenone and 0.9 gm phenyl hydrazine by warming a mixture in 3 ml of alcohol and few drops of glacial acetic acid. Filter the reaction mixture. Wash with dilute HCl followed by rectified spirit. Take 1 gm of Phenyl hydrazones in a beaker containing 6.42 gm of PPA. Heat on boiling water bath.Stirr with maintained temperature at 100-

120⁰C for 10 mins. Add cold water stir well to complete solution of PPA .Filter the product.

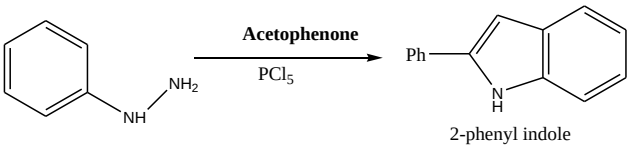
2. Use of $ZnCl_2$ as Lewis Acid:

The routine method is modified by use of $ZnCl_2$ as Lewis acid as follows



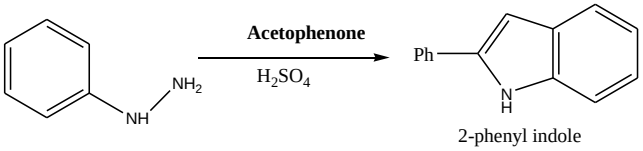
2-phenyl indole

3. PCl_5 as Lewis acid:



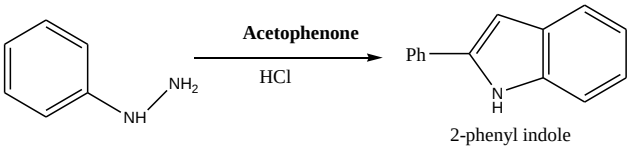
2-phenyl indole

4. Use of H_2SO_4:



2-phenyl indole

5. Use of HCl:

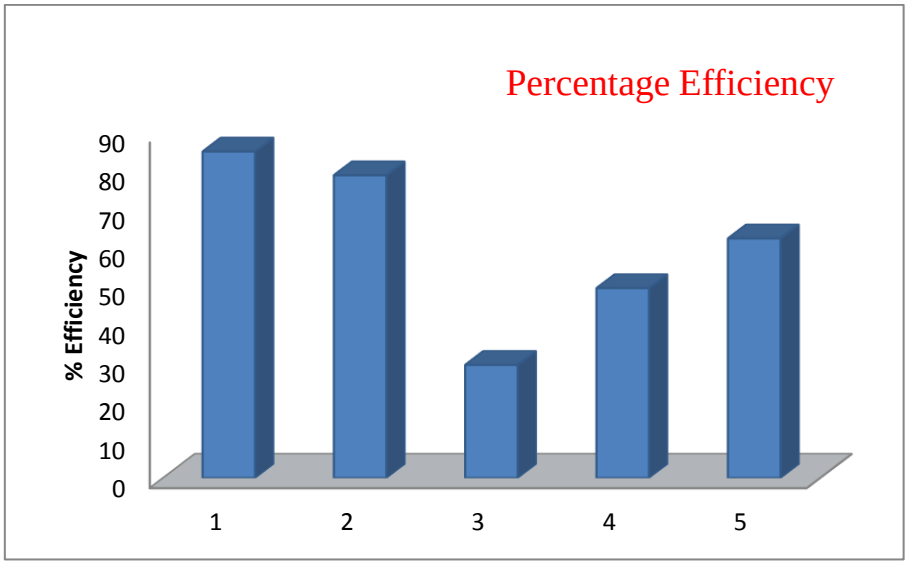


2-phenyl indole

III. RESULTS AND DISCUSSION

Table 1

S.N	Name of Reaction	Dist. travelled by reactant in cm	Dist. travelled by product in cm	Solvent run in cm	Yield
01	Fisher Indole Synthesis	2.9	3.4	4.0	85%
02	Indole synthesis by $ZnCl_2$	3.8	4.3	5.0	67%
03	Indole synthesis by PCl_5	2.5	2.9	3.6	25%
04	Indole synthesis by H_2SO_4	2.5	3.0	3.4	42%
05	Indole synthesis by HCl	3.2	3.7	4.2	53%



IV. CONCLUSION

1. Routine synthesis of indole is as per method given as above. The synthesis can efficiently carried out by ZnCl2, H2SO4, HCl etc.
2. These reactions are cost effective and less polluted.

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