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A PROJECT REPORT ON

"SYNTHESIS OF 2,3 –DIHYDROQUINAZOLIN- 4(1-H)-ONE BY USING ACIDIC IONIC LIQUID"

SUBMITTED TO

VIVEKANAND COLLEGE, KOLHAPUR (Autonomous)

As Partial fulfilment for the award of the degree of

Master of Science [2019-20]

IN

ORGANIC CHEMISTRY

UNDER THE FACULTY OF SCIENCE

By

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UNDER THE GUIDANCE OF

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M. Sc. Ph.D.

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VIVEKANAD COLLEGE, KOLHAPUR (Autonomous)

CERTIFICATE

This is to certificate that **Mr. Mahesh Pandit Kumbhar** has submitted the project work on the "**SYNTHESIS OF 2,3 – DIHYDROQUINAZOLIN- 4(1-H)-ONE BY USING ACIDIC IONIC LIQUID**" This is being submitted here with for the partial fulfilment for the award of degree **Master of Science** in **Organic Chemistry at Vivekanand College, Kolhapur (Autonomous)**. This is the result of the original work carried out under my guidance.

Date:

Place: Kolhapur

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DECLARATION

I undersigned, hereby declare that this project report entitled **"SYNTHESIS OF 2,3 –DIHYDROQUINAZOLIN- 4(1-H)-ONE BY USING ACIDIC IONIC LIQUID"** is the original work carried out by us at the Department of Chemistry, Vivekanand College, Kolhapur (Autonomous). This Project report not submitted for award of any degree, diploma or any similartitle of this or any other university.

Date:

Place: Kolhapur.

Mr. Mahesh Pandit Kumbhar

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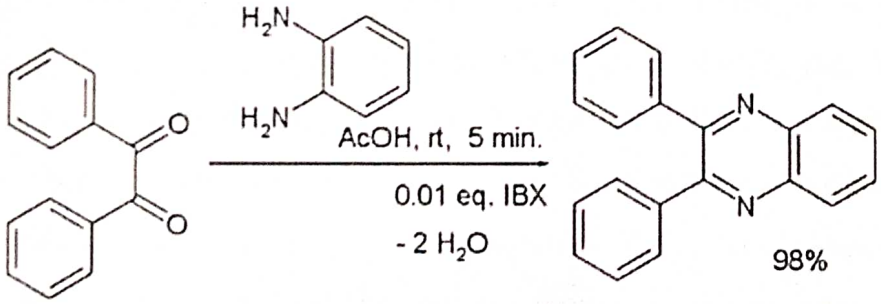
INTRODUCTION

QUINOXALINE:

It is the basic skeletol structure of the 2,3-dihydroquinazolin-4(1H)-ones. A quinoxaline, also called a benzopyrazine, in organic chemistry, is a heterocyclic compound containing a ring complex made up of a benzene ring and a pyrazine ring. It is isomeric with the naphthyridines including quinazoline, phthalazine and cinnoline. It is colorless oil that melts just above room temperature. Although quinoxaline itself is mainly of academic interest, quinoxaline derivatives are used as dyes, pharmaceuticals (such as varenicline), and antibiotics such as olaquindox, carbadox, echinomycin, levomycin and actinoleutin.

SYNTHESIS

They can be formed by condensing ortho-diamines with 1,2-diketones. The parent substance of the group, quinoxaline, results when glyoxal is condensed with 1,2-diaminobenzene. Substituted derivatives arise when α-ketonic acids, α-chlorketones, α-aldehyde alcohols and α-ketone alcohols are used in place of diketones. Quinoxaline and its analogues may also be formed by reduction of amino acids substituted 1,5-difluoro-2,4-dinitrobenzene (DFDNB). One stud used 2-iodoxybenzoic acid (IBX) as a catalyst in the reaction of benzil with 1, 2-diaminobenzene:



Uses :

Quinoxaline is used for mainly as pharmacological applications such as treatment of bacterial, cancer, HIV, infections.

2,3 – Dihydroquinazolin – 4(1-H) –One

Synthesis of 2,3-dihydroquinazolin-4(1H)-ones by using anthranilamide and 4 – nitro benzaldehyde in presence of acidic catalyst and Ethanol as a solvent.

Introduction of Ionic Liquid:

The compound which are completely composed of ions with melting point below 100 c , known as ionic liquid

Acidic ionic liquid : An ionic liquid can be defined as a low melting ionic salt with acidic charaterisation .

Ionic liquid: Synthesis and application in catalysis

Acid-catalyzed reactions involve one of the most important technologies applied in the chemical industry. Mineral acids, used in homogeneous phase reactions, usually show high catalytic activity, but they suffer from several drawbacks, such as the problems of side reactions, corrosion of the equipment and large amounts of acidic wastes. These reactions require tedious isolation of products, which can cause environmental problems.

Solid acids are more widely used since, as non-volatile materials, they are less harmful than traditional liquid acids]. However, these heterogeneous systems often show an inferior activity when compared to their homogeneous counterpart. The shortcomings include matrix-bound acidic sites, high molecular weight/active-site ratios, the necessity of using longer reaction times and rather extreme reaction conditions that may lead to deactivation because of coking.

As a result, great efforts were made towards the development of new catalysts. One possibility is the use of acidic ionic liquids (ILs). Synthesis, physicochemical properties and fields of application of these compounds have been summarized in several recent reviews . ILs is salts consisting of bulky organic cations and inorganic or organic anions .They melt at relatively low temperature, usually below 100 °C, have negligible vapor pressure and they are not flammable which makes them very easy and safe to handle. They dissolve both polar organic molecules and inorganic salts so they can replace volatile organic solvents. Mainly because of their low volatility, they are considered to be "green solvents", however, their toxicity, investigated more thoroughly .

Because of the great variety of anion—cation pairs and the diversity in the side chains of the cations, an almost infinite IL combinations can be produced. Task-specific ILs can be developed by the fine-tune of their physical and chemical properties through a careful choice of the structure of the cation—anion pair. Such ionic liquids may have catalytic properties and can serve both as catalysts and solvents . Besides, they make possible the immobilization of organo catalysts or organometallic catalysts too. As most of the ILs do not dissolve a polar compounds, when the polarity of the products are sufficiently low, biphasic reactions may take place. After the completion of the reaction, the products can be separated by simple decantation and the IL phase can be reused.

Regarding catalytic properties, acidic ILs can be considered among the most important representatives of these compounds. Acidity may be due either to the anion or to the cation of the IL . ILs with polynuclear metallic anions, such as chloroaluminate, chloroferrate or chlorozincate ions, show Lewis acidity when the Lewis acid (e.g., $AlCl_3$), which forms the counteranion, is used in excess. In such acidic melts, the anions $Al_2Cl_7^-$ and $Al_3Cl_{10}^-$ exist, which act as very strong Lewis acids.

The presence of the SO_2Cl group in the side chain of the cation ($[(C_1{=}C_2)(ClO_2S)^4C_4im]^+$ or $[(C_1{=}C_2)(ClO_2S)^3C_3im]^+$, may also lead to Lewis acidity, since the LUMO orbital of methanesulfonyl chloride is mainly localized on sulfur atom and its energy is −2.35 eV as determined by a MOPAC-AM 1 calculation by Hagiwara *et al.*

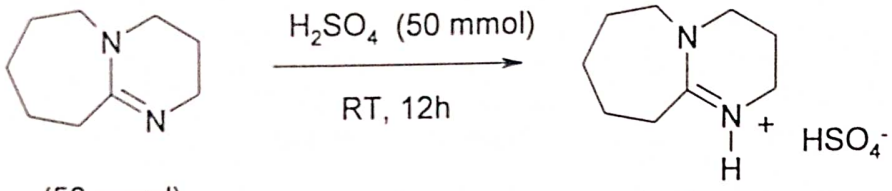
Brønsted acidic ILs can be prepared by the use of HSO_4^- or $H_2PO_4^-$ anions or by the introduction of alkane sulfonic acid or carboxylate acid groups as side chains of the cations. Combination of these two approaches leads to the so called "dual acidic" ionic liquids.

$[C_1Him][BF_4]$ shows higher acidity compared to dialkylimidazolium ILs. Its catalytic effect is mainly due to the more facile formation of a hydrogen bond between the C-2 hydrogen of the imidazolium ion and a suitable acceptor. Theoretical calculations proved that the presence of Brønsted acidic fragments on the cations could enhance the Lewis acidity on another site of the IL, e.g., at the C-2 position of

the imidazolium ring . At the same time, the counterions were also shown to have a decisive effect not only on the acidity of the IL but also on the location of the Lewis acidic site in the cation .

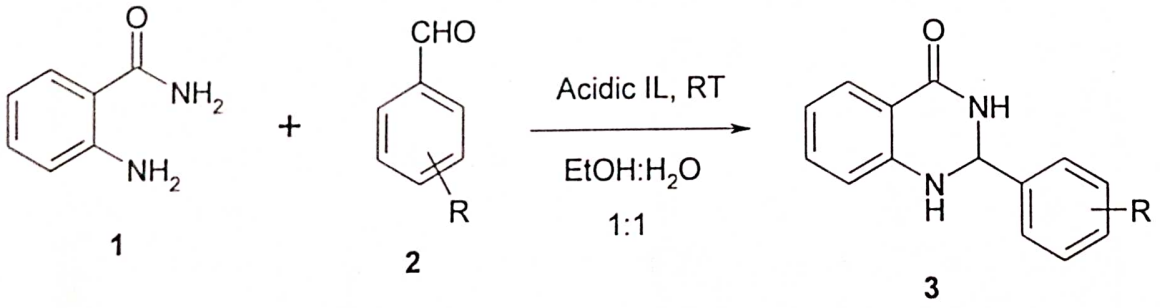
PRESENT WORK:

The synthesis of 2,3-dihydroquinazolin-4(1H)-ones is done by using Acidic Ionic liquid in the presence of Ethanol.

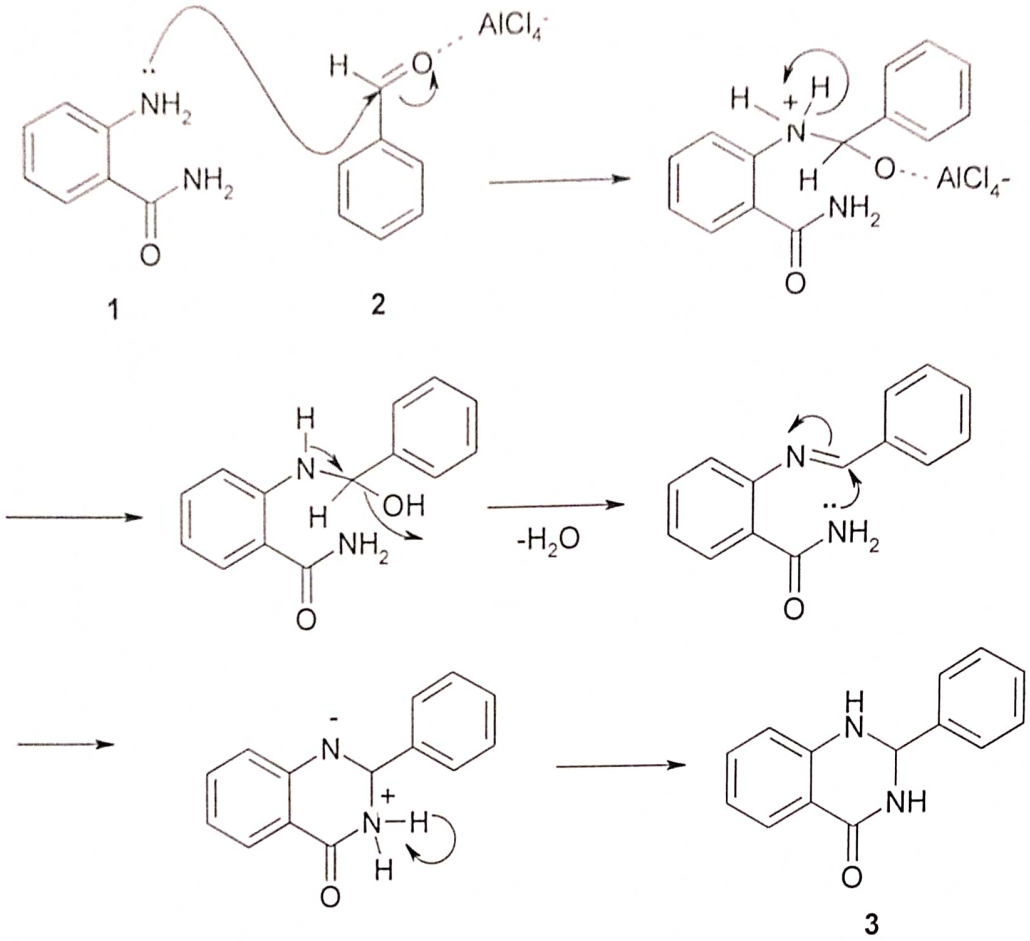


Scheme 1: Synthesis of Acidic Ionic liquid

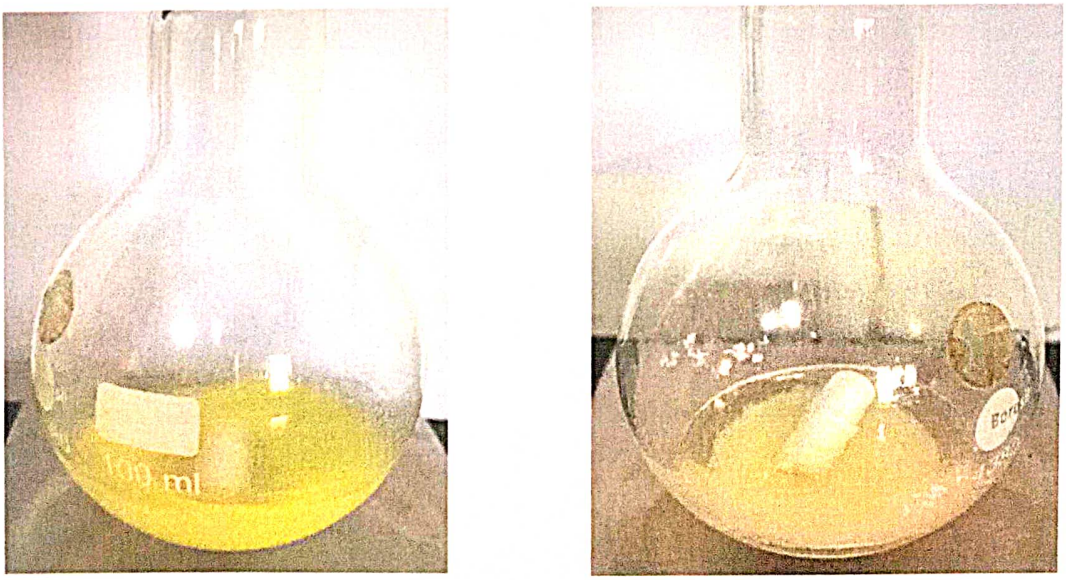
This reaction is two component reaction. Anthranilamide and 4- Nitro benzaldehyde are used as a substrate. this reaction is carried out at 2 mmole. The molecular weight of anthranilamide is 136.15 therefore we taken it as 0.272 mm and the molecular weight of 4- nitro benzaldehyde is 140 therefore we taken it as 0.28 mm. Both these chemical added in 100 ml round bottom flask which contain Ethanol as solvent and Acidic ionic liquid as a catalyst. Therefore the above reaction mixture is heated for 2 hour hence we get 2,3-dihydroquinazolin-4(1H)-ones.



Scheme 1: Synthesis of Quinoxaline



Scheme 2: Plausible Mechanism of 2,3-dihydroquinazolin-4(*1H*)-ones



Before start of Reaction **After complition of Reaction**

Fig. Progress of Reaction

Experimental

- **Procedure for Acidic ionic liquid:**

A mixture of 1,8-Diazabicyclo(5.4.0)undacane-7-ene (DBU)(13.8 mmol) and sulphuric acid (13.8 mmol) were added in 100 mL round bottom. The reaction mixture was stirred for 15 hrs at room temperature and then it was dried in dried in oven and used for carrying out the reactions.

Procedure for synthesis of 2,3-dihydroquinazolin-4(1H)-ones.

A mixture of aromatic aldehyde (2mmol), Anthranilamide (2mmol), and Acidic ionic liquid (20 mol%) were added in a 100 mL round-bottomed flask containing 10 mL of ethanol solvent system and the reaction mixture and refluxedat 70°C for further 2h. After completion of the reaction (by TLC), the solid residue (crude product) was obtained and filtered through whatmann filter paper

Table No.3: Substrate scope

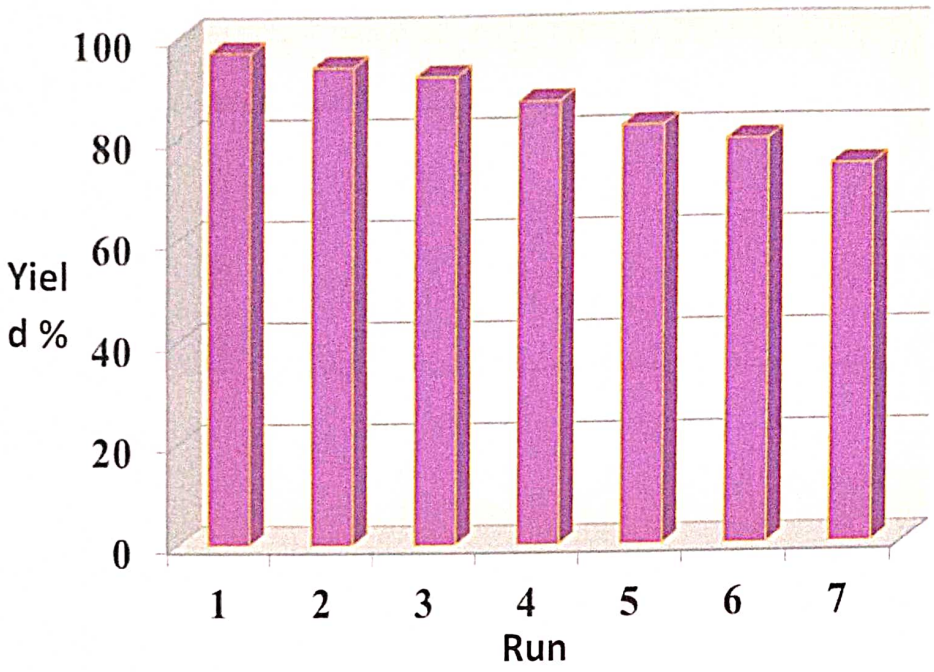
Sr No.	Aldehyde	Solvent system Water+ Ethanol	% Yield in [a]	M.P. in °C
1	Anisaldehyde	50:50	37	316-318
2	Vanillin	50:50	37	300-302
3	4-Cyano Benzaldehyde	50:50	35	320-322
4	3 bromo benzaldehyde	50:50	50	260-262
5	4 Hydroxy Benzaldehyde	50:50	33	318-320
6	Furfural	50:50	35	310-312
7	2,4-Dichloro benzaldehyde	50:50	43	300-302

8	4 Methyl Benzaldehyde	50:50	35	310-312
9	4 Nitro Benzaldehyde	50:50	54	250-252
10	3,4 Dimethoxy Benzaldehyde	50:50	47	260-262
11	3-Benxoloxy Benzaldehyde	50:50	28	310-312
12	p-Dimethyl Amino Benzaldehyde	50:50	37	330-332

[a] Isolated yield

Reusability of Ionic Liquid:

The main advantage of using IL is that it can be recycled. After completion of the reaction as confirmed by TLC, the solid product formed was filtered from the reaction mixture. The remaining filterate was evaporated and washed with ethyl acetate to get the IL back. The recovered IL was dried at 60^0c and used for subsequent reaction.It was found that IL can be used effectively at least six times without any loss in yield of product.



THIN LAYER CHROMATOGRAPHY

The technique of Thin Layer Chromatography was first introduced by lzmailov and Schreiber in 1938. TLC is often named by other names such as drop. Strip. Spread layer. Surface chromatography and open column chromatography. The chromatographic separation of mixture is based on difference in absorptivity of its components.

EXPERIMENTAL TECHNIQUE OF TLC

1. Preparation of sample solution:

A sample to be analyzed was firstly dissolved in a suitable solvent like chloroform, Ethanol, Acetone, DMF, etc. to get clear solution. This clear solution was then used for analysis.)

2. Preparation of chromatographic plates:

First adsorbent medium silica gel was activated in oven at 110 'C for I hour about 20g of silica gel was mixed with 40 m of chloroform & Slurry was prepared. It was then applied to glass plates. These glass plates were kept tor drying at room

temperature. The recommended thickness of adsorbent layer is about 150-250 micrometer.

3. Application of sample:

Parent compound dissolved in alcohol &product compound dissolved in alcohol and solution were applied on the help of capillary tube .1he origin line of which the sample solution is applied is usually located 2-2.5 cm apart from bottom of plate. After first application was done then air dry.

4. Solvent system:

The choice of solvent system was determined by the principle of chromatography to be used. The solvent should be non polar & volatile. The solvent used are acetone, toluene and pet ether.

5. Development of plates:

Ascending Chromatography was used for TLC the plates were placed in the developing chamber of glass at angle 45 C. The bottom of the chamber was covered up to nearly 1cm by the solvent Alight lid was put on the chamber. After sufficient running of the solvent on TLC plate. Plates removed from the chamber &air dry at room temperature. Then these plates were placed in iodine chamber for few minutes, Coloured spots were developed. RF values of compounds determined by formula.

$$RF = \frac{\text{Distance travelled by solute.}}{\text{Distance travelled by solvent.}}$$

CONCLUSION

In this work we have reported the preparation of 2,3-dihydroquinazolin-4(1H)-ones by using anthranilamide and 4- nitrobenzaldehyde usig acidic ionic liquid at high temp. The protocol involve very simple method of preparation of 2,3-dihydroquinazolin-4(1H)-ones. No column cromatography is necessary to purify the product formed, during the reaction , just only by simple filtration the product can be obtained. The used ionic liquid can be reused effectively without loosing its catalytic property.

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