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Research Article

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Synthesis of β-amino ketones by Mannich reaction using Ionic liquids containing carboxyl functional group in aqueous media.

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ABSTRACT
The previous research describe anion-functional acidic ionic liquids (1-methylimidazolium trifluoro acetic acid [Hmim] [Tfa]) which are useful in three reactant Mannich reaction at reaction conditions, found to be very difficult to use in the reaction. Thus, in the present research, an attempt was made to Synthesize β-amino ketones using this carboxyl functionalized ionic liquids in aqueous medium such as 1-Carboxymethyl -3-methylimidazolium tetrafluoroaluminate [CMMIM][AlF4],1-butyl-3-methylimidazolium tetrafluoro aluminate i.e.[BMIM][AlF4]. The process used for anion-functional acidic ionic liquids was found to be eco-friendly with good yield, simple work-up & recovery of Catalyst.

KEYWORDS
Ionic liquids, [CMMIM][AlF_4], β $-$*amino ketone.*

1. INTRODUCTION

Homogeneous catalysts gives us better selectivity, efficiency and results under the mild conditions. But the in homogeneous catalysis recovery of catalyst is difficult. In heterogeneous catalysis the problem of recovery of catalyst is not created. However researcher requires both the catalytic condition so we need to develop such catalyst that can work in homogeneous and heterogeneous catalytic condition we named this new suitable catalyst as 'functionalized ionic liquids.' That can work in olefinic metathesis, acetalization, Michael addition reaction. β-aminno ketones are the main building blocks of many biologically active compound.it can be synthesized by using aromatic aldehydes, anilines, acetophenones by using Mannich reaction in inorganic acidic condition i.e. Pralin, Hydrophobic polystyrene supported sulphonic acid (PS-SO_3H).

Zhao and Co-workers reported several anion-functional acidic ionic liquids (1-methylimidazolium trifluoro acetic acid [Hmim] [Tfa]) which is useful in three reactant Mannich reaction at 25^0C in vacuum condition, but it very tedious and energy consuming process and recovery of Ionic liquids is very difficult.

We tried to Synthesize β-amino ketones using this carboxyl functionalized ionic liquids in aqueous medium. Some of the ionic liquids that we have synthesized so far are 1-Carboxymethyl -3-methylimidazolium tetrafluoroaluminate [CMMIM][AlF4],1-butyl-3-methylimidazolium tetrafluoro aluminate i.e.[BMIM][AlF4].

2. MATERIALS AND METHODS

Methods

Preparation of [CMMIM][AlF_4]

About 4.7 gm of ∝-chloroacetic acid (0.1 M) added to 4.1 gm of 1-methyl-imidazole (0.1 M) drop by drop with constant stirring and the reaction mixture was heated at 80^0 C for 2 hours, solid mass is obtained which was cooled at room temperature and it was washed with diethyl ether, the dried compound is further reacted with 5.45 gm of $NaAlF_4$ (0.1 M) and it is dissolved in distilled water and refluxed for 3 hours and reaction mass dried in desiccator & by HPLC its purity is 96 % pure.

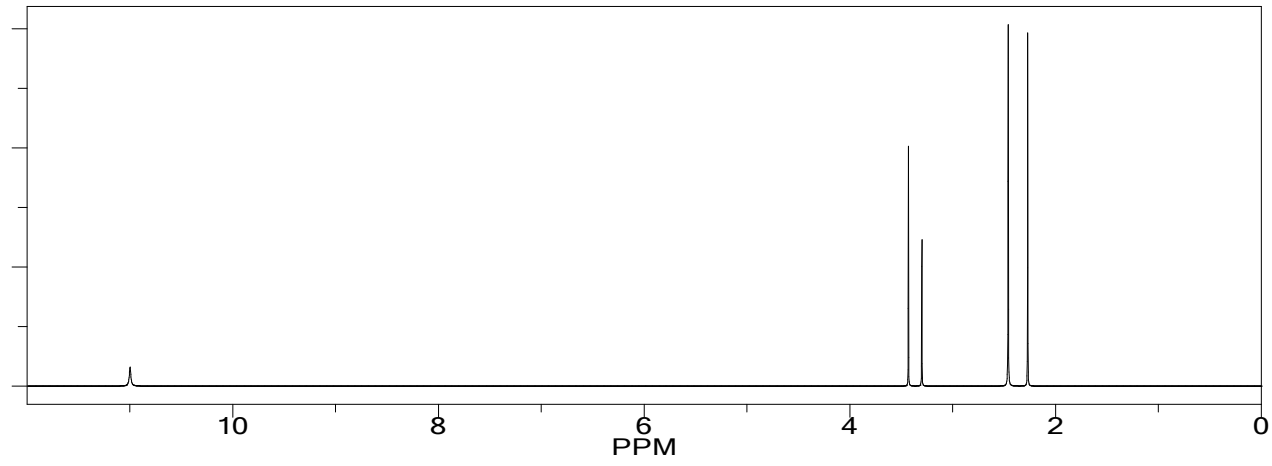

Fig.1. H1- NMR Spectrum of **[CMMIM][AlF_4].**

Synthesis of β −amino ketones

0.5 gm of aniline, 5 gm of acetophenone and 5 gm benzaldehyde mixed with 5 ml of aqueous 0.5 gm of [CMMIM][AlF_4] the reaction mixture was kept in Micro wave oven for 10 second at 300 watt, the reaction was monitored by TLC, on completion of reaction the crude product was recrystallized with the help of ethanol and then purified by using column chromatography. The catalyst was reused for 5 times.

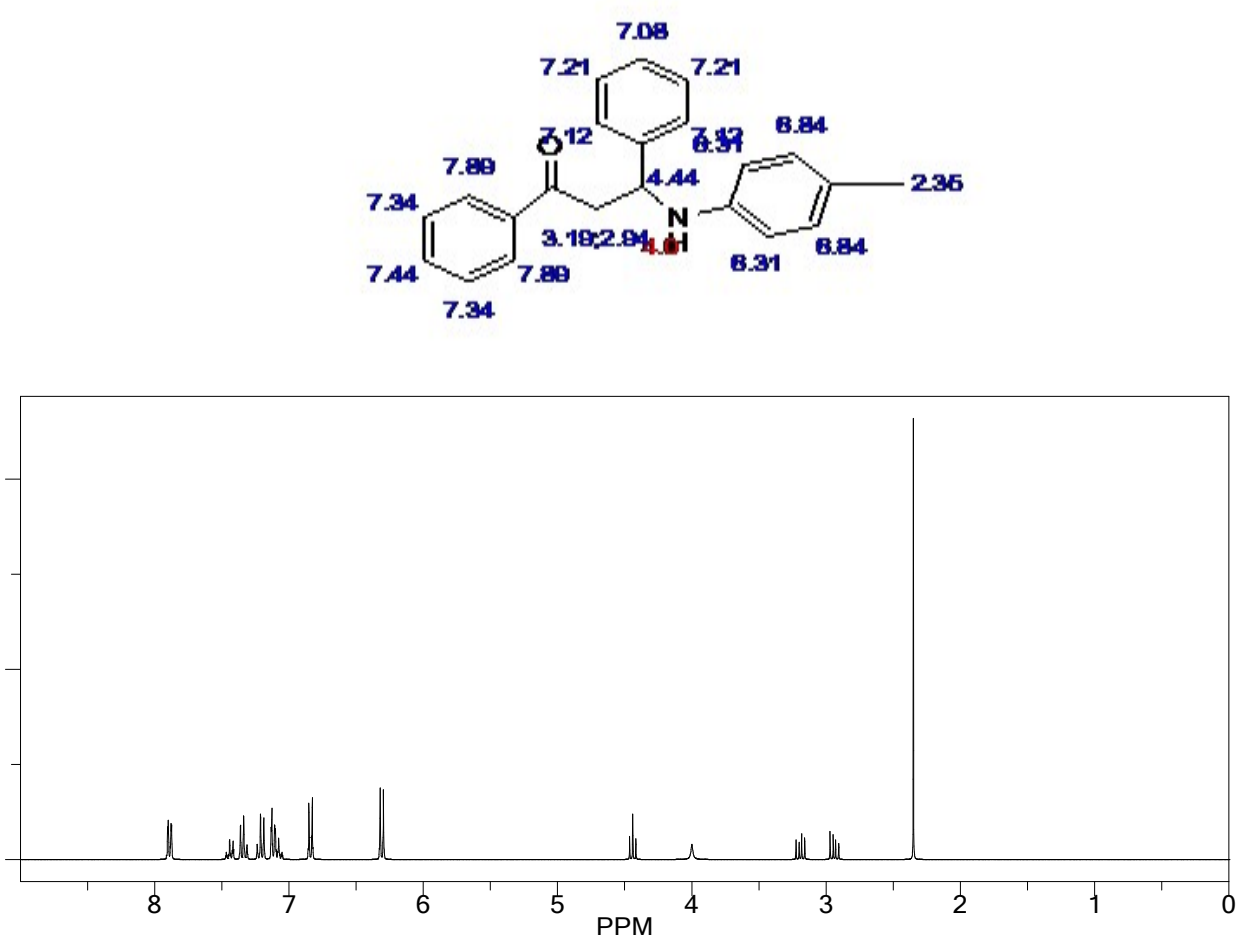

Fig. 2. H1- NMR Spectrum of *β −amino ketones.*

3. RESULTS AND DISCUSSION

When ionic liquids [CMMIM][AlF_4] is mixed in the reaction mixture of benzaldehyde, acetophenone and aniline and also in ionic liquids [BMIM][AlF_4] this is mixed with water to make heterogeneous in 1: 2 portion to give beta amino ketones in more than 95% yield. The following chart shows effect of ratio of [BMIM][AlF4] and water on Yield.

Table 1. Effect of ratio of [BMIM][AlF4] and water on Yield.

Sr. No.	[BMIM][AlF_4]/H_2O	Yield %
1	1:1	85%
2	1:2	95%
3	2:1	80%

The effect of catalyst and solvent plays an important role in the yield of β-amino ketones is seen which we put in the following table [CMMIM][BF_4]/H_2O as catalyst & [BMIM]BF_4/H_2O as a solvent gives better yield (95%).

Table 2. Effect of catalyst and solvent.

Sr. No.	Solvent	Catalyst	Yield %
1	[BMIM]BF_4/H_2O	[CMMIM][BF_4]	95%
2	Ethanol	Conc. HCl(35%)	80%
3	Ethanol	Acetic Acid	25%
4	H2O	PTSA	80%

Ionic liquids are very efficient & easy for reuse rather than to use traditional solvents, as well as after completion of reaction and separation of product the catalyst containing aqueous media was reused no need to purify it & the solvent can be recycled 5 times with best yield with purity nearly 90 %.

4. CONCLUSION

For Mannich Reaction Ionic liquids are the efficient catalyst which includes the reagent aldehydes, amines, acetophenone in aqueous [BMIM][BF_4]. This method is eco-friendly with good yield, simple work-up & recovery of Catalyst.

5. ACKNOWLEDGEMENT

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6. CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

7. REFERENCES

1. Ranu, B. C., Dey, S. S., & Hajra, A. (2003). Catalysis by an ionic liquid: efficient conjugate addition of thiols to electron deficient alkenes catalyzed by molten tetrabutylammonium bromide under solvent-free conditions. *Tetrahedron*, *59*(14), 2417-2421.
2. Earle, M. J., K. R. Seddon, and R. Sheldon. "Catalytic reactions in ionic liquids." *Pure Appl. Chem* 72 (2000): 1391-1398.
3. B. C. Gates, Catalytic Chemistry (Wiley-Interscience, New York, 1991) Ch.6.
4. G.W. Parshall and S.D. Ittel, Homogeneous Catalysis (John Wiley & Sons, New York, 1992).
5. List, B., Pojarliev, P., Biller, W. T., & Martin, H. J. (2002). The proline-catalyzed direct asymmetric three-component Mannich reaction: scope, optimization, and application to the highly enantioselective synthesis of 1, 2-amino alcohols. *Journal of the American Chemical Society*, *124*(5), 827-833.
6. Li, J., Peng, Y., & Song, G. (2005). Mannich reaction catalyzed by carboxyl-functionalized ionic liquid in aqueous media. *Catalysis Letters*, *102*(3-4), 159-162.
7. Zhao, Guoying, Tao Jiang, Haixiang Gao, Buxing Han, Jun Huang, and Donghai Sun. "Mannich reaction using acidic ionic liquids as catalysts and solvents." *Green Chemistry* 6, no. 2 (2004): 75-77.
8. Zhao, G., Jiang, T., Gao, H., Han, B., Huang, J., & Sun, D. (2004). Mannich reaction using acidic ionic liquids as catalysts and solvents. *Green Chemistry*, *6*(2), 75-77.