

# Magnesium Chloride Catalyzed: Multi-Component Synthesis of Tri-Substituted Imidazole

Amit P. Tayade<sup>1</sup> Ramkrushna P. Pawar<sup>2</sup> Rajiv V. Khobare<sup>3</sup> Chandakant B. Mane<sup>4</sup> Nitin P. Tayde<sup>5</sup>

<sup>1,2,3,4,5</sup>Department of Chemistry

<sup>1,3</sup>Dr. Babasaheb Ambedkar Marathwada University Aurangabad, India <sup>2</sup>Govt. Vidarbha Institute of Science and Humanities Amravati, India <sup>4</sup>Shri Vijaysinha Yadav Arts & Science College pethvadgaon Dist Kolhapur, India <sup>5</sup>Anuradha Engineering College of Chikhli Dist Buldhana, India

**Abstract**— synthesis of 2,4,5 tri-substituted imidazole derivatives have been achieved via one pot reaction of various aromatic aldehyde, benzil and ammonium acetate promoted by magnesium chloride in acetic acid as solvent. Reaction carried out at 90°C for 60 to 90 minutes with different derivatives of aldehyde.

**Keywords:** MCR, Imidazole, Benzil, Ammonium Acetate, Aldehyde, Acetic acid, MgCl<sub>2</sub>

## I. INTRODUCTION

Imidazole and its derivatives have a variety of biological activities. Its show properties such as antifungal, antiprotozoal, fungicides and antihypertensive etc. The synthesis of 2,4,5- triarylimidazole derivatives involves a coupling of aromatic aldehyde, benzil and ammonium acetate. This process has been carried out by different reagents and catalyst. Also, multicomponent reaction (MCR) has been used for the synthesis of variety of natural products and biological active compound. MCR have advantage such as minimum of waste, versatility, ecofriendly nature, simple work up group compatibility. In this context we have given alternate convenient and simple path being product by magnesium chloride as a catalyst for synthesis of 2,4,5- triaryl imidazole. The reaction carried out by conventional heating

(hot plate with magnetic stirrer) process up to 60 to 90 minutes.

## II. EXPERIMENTAL

### A. Experimental Section

All chemical were purchased from Merck, sdcl were commercially available and were used as received without further purification. Melting points were measured by open capillary method incorrectly. IR data collected on (range 4000-400) NMR Data recorded on bruker avance neo 500 NMR DMSO -d<sub>6</sub> MHz spectrometer

### B. General method for synthesis of 2, 4, 5 tri substituted imidazole:-

In round bottom flask benzil (1mmol), aldehyde (1mmol), ammonium acetate (4mmol) were added with magnesium chloride (10% mol) at 90 °c with 10 ml acetic acid as solvent for about 60 mint to 90 minutes with variable aldehyde. Reaction monitor by TLC. After completion of reaction was cooled to room temperature and solid substances washed with water which give the crude product for further purification it was recrystallized from ethanol to get pure product.

## III. REACTION

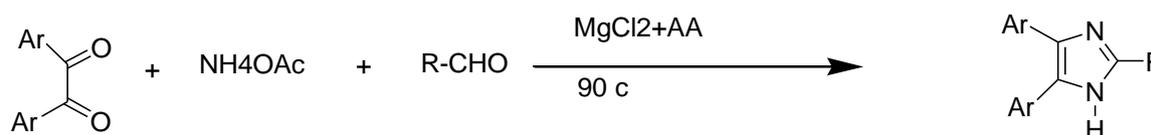


Fig. 1: Synthesis of 2,4,5-imidazole catalyzed by zinc powder in acetic acid

Experimental table: 1 - One pot synthesis of 2,4,5-tri substituted imidazole using catalyst magnesium chloride from various aldehyde

Sr no	Aldehyde	Products	Melting point
1	C <sub>6</sub> H <sub>5</sub>	80	270-271
2	4-OCH <sub>3</sub> C <sub>6</sub> H <sub>5</sub>	80	221-222
3	4-ClC <sub>6</sub> H <sub>5</sub>	80	260-262
4	3-NO <sub>2</sub> C <sub>6</sub> H <sub>5</sub>	60	302-310
5	4-NO <sub>2</sub> C <sub>6</sub> H <sub>5</sub>	80	228-230
6	4-NMe <sub>2</sub> -C <sub>6</sub> H <sub>5</sub>	75	251-256
7	2-OH- C <sub>6</sub> H <sub>5</sub>	70	200-205

### A. Spectral and analytical data

1) ENTRY 3-2-(4-chlorophenyl)-4,5-diphenyl-1H-imidazole M.P.-260-262 1H NMR-(500MHz-DMSO)- δ12.75, δ 8.15, δ7.58, δ 7.58, δ 7.44, δ 7.23, δ3.40, δ 2.50, C NMR--(125 MHz- DMSO d 6) - δ

144.41,137.30,135.00,132.00,129.18,128.56,126.52, 39.81

2) ENTRY 7- 2-(2-hydroxyphenyl)-4,5-diphenyl-1H-imidazole M.P. 200-205

1H NMR(500 MHz- DMSO d 6) - δ13.09, δ 8.96, δ 8.22, δ 7.79, δ 7.46, δ 7.27, δ 3.33, δ 2.51, δ 2.49

C NMR-(125 MHz- DMSO d 6) - δ148.28, 143.28, 131.75, 130.31, 127.06,122.49,119.31,39.77.

## IV. RESULT AND DISCUSSION

We conceived the preparation of diverse substituted imidazole and its derivatives synthesis of by using magnesium chloride powder in acetic acid through a condensation in between aldehyde, benzil, ammonia and ammonium acetate at 90 C gives product. Consequently the amount of magnesium chloride was selected as the optimized amount of catalyst gives good result in between 70% to 80% yield. Encouraged by these expected result, we have uses the

same methodology on other aldehyde. Proposed mechanism for the formation of product and influence magnesium chloride are shown in table -1.

## V. CONCLUSION

In conclusion, by using available chemical in laboratory which help to carried out above reaction in simple manner we have prepared very simple and efficient method for the good yielding synthesis of 2,4,5- triaryl – 1H- imidazole using magnesium chloride as catalyst in acetic acid. By using this protocol catalyst may be consider as improvement over costly and complex catalytic agent alternative way gives best result in short reaction time.

## ACKNOWLEDGEMENT

The authors gratefully acknowledge the constant encouragement and support of the Head, Department of chemistry, Dr. BAMU Aurangabad. Principal, Deogiri College Aurangabad, Authors are also thankful to Dr. R.P. Pawar Department of chemistry, Deogiri College Aurangabad for IR spectral data and Dr. R. P. Pawar GVISH College Amravati for kind support through the completion of this work. We are also thankful SAIF Panjab University Chandigarh for analytical facilities.

## VI. CONFLICT OF INTEREST

The author have declared that no conflict of interest exists

## REFERENCES

- [1] Samai S, Nandi G.C, Singh P, Singh MS.L-Proline : An efficient catalyst for one pot synthesis of 2,4,5 trisubstituted and 1245 tetra substituted imidazole. *Tetrahedron*,2009 ,65 : 10155-10161
- [2] Anshu Dandia, Vijay Parewa, Amit Sharma, Kuldeep Rathore.Co-Doped Zns nanoparticles as a recyclable catalyst for aq mediated synthesis of 2,4,5-triaryl-1H-Imidazoles under ultrasonic irradiation *Eur.Chem.Bull.*2013,2(12),971-974
- [3] Kumar V. Mamgain R, Singh N.synthesis of substituted imidazole via a multi component condensation catalyzed by P-toluenesulfonicacid(PTSA) *Res. J.Chem Sci.*2012;2(4).18-23
- [4] Runxia Wang, Chunsheng Liu and Genxiang Luo. A convenient synthesis of 2,4,5- triaryl imidazoles catalyzed by Y(TFA)<sub>3</sub>. *Green chemistry letters and reviews* 2010.vol3 . no .2. 101-104.
- [5] Bahrami K. Khodaei MM, Nejadi A. One pot synthesis 1,2,4,5 tetra substituted imidazole and 2,4,5 trisubstituted by zno as efficient and reuseable catalyst *monatsh chem.*,2011 , 142 , 159-162
- [6] H N Roy, M M Rahman and P K Pramanick .Rapid access of some trisubstituted imidazoles from benzyl condensed with aldehydes and ammonium acetate catalyzed by l- cysteine. *Indian journal of chemistry* .2013. vol.52B.PP153-159.
- [7] Maleki A, Alirezavani Z, Malike S, A highly synthesis of 245 trisubstituted imidazole catalyst by mag nanopartical under mild reaction condition. DOI: 10.3390/ec soc-18- a003
- [8] Adel A. Marzouk, Vagif M. Abbasov, Avtandil H. Talybov, Shaaban Kamel Mohamed. Synthesis of 2,4,5-triphenyl imidazole derivatives using Diethyl ammonium hydrogen phosphate as green, fast and reusable catalyst. *world journal of organic chemistry*.2013.vol.1.no.1,6-10
- [9] Saikat Das Sharma, Parasa Hazarika, Dilip Konwar. And efficient and one pot synthesis of 2,4,5- trisubstituted and 1,2,4,5-tetrasubstituted imidazoles catalyzed by InCl<sub>3</sub>.3H<sub>2</sub>O. *tetrahedron letters*.49(2008)2216-2220
- [10] S.Fozooni, H. Khoshdast, H.Hassani,H.Hamidian.synthesis of oxazolone and imidazolone derivatives in presence of H<sub>2</sub>O<sub>2</sub> promoted fly ash as a novel and efficient catalyst *journal of sciences, Islamic republic of iran*.2017. 28(3):321-230.
- [11] Sami Ullah Bhat, Rawoof Ahmad Naikoo, Muzzaffar Ahmad Mir, Radha Tomar. Synthesis of tetra substituted imidazoles derivatives by condensation reaction using zeolite H-ZSM 22as heterogeneous solid acid catalyst.2016,.vol8.39-39.
- [12] Behrooz Maleki, Hossein Keshvari and Ali Mohammadi. Ammonium chloride; An effective catalyst for the one pot synthesis of 2,4,5- trisubstituted imidazoles. *Oriental journal of chemistry*,2012,vol.28 no.(3)1207-1212
- [13] Sondhi S M, Jain S. Dinodia M Kumar A, synthesis of some thiophene imidazole and pyridine derivatives exhibiting god anti inflammatory and analgesic activities. *Med.Chem* 2008.4.146-54
- [14] Sathe B S, Jaychandran E. Jagtap V A, Deshmukh S D, synthesis and antifungal screening of fluoro benzothiazole imidazole derivatives *Pharm.chem.*2011,3,305-9.
- [15] E Rajanarendar, K Rama Murthy and M Nagi Reddy. A mild and efficient four component one pot synthesis of 2,4,5-triphenyl -1-(1H-1imidazolyl )isoxazoles catalyzed by ceric ammonium nitrate. *indian journal of chemistry* .2011.,vol 50B, pp 926-930
- [16] Heravi M M Bakhtiari. K. Oskooie H.A. Taheri S.J.. *Mol. Catal A.Chem*,2007,263,279