



ONE POT, MULTICOMPONENT SYNTHESIS OF 2,4,5-TRI-SUBSTITUTED IMIDAZOLE CATALYZED BY ZINC IN ACETIC ACID

Amit P. Tayade*, Ramkrushna P. Pawar**, Rajiv V. Khobare*, Chandakant B. Mane*** & Nitin P. Tayde****

* Department of Chemistry, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, Maharashtra

** Department of Chemistry, Government Vidarbha Institute of Science and Humanities, Amravati, Maharashtra

*** Department of Chemistry, Shri Vijaysinha Yadav Arts & Science College, Pethvadgaon, Kolhapur, Maharashtra

**** Department of Chemistry, Anuradha Engineering College, Chikhli, Buldhana, Maharashtra

Cite This Article: Amit P. Tayade, Ramkrushna P. Pawar, Rajiv V. Khobare, Chandakant B. Mane & Nitin P. Tayde, "One Pot, Multicomponent Synthesis of 2,4,5-Tri-Substituted Imidazole Catalyzed by Zinc in Acetic Acid", International Journal of Current Research and Modern Education, Volume 4, Issue 2, Page Number 5-7, 2019.

Copy Right: © IJCRME, 2019 (All Rights Reserved). This is an Open Access Article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Abstract:

The preparation of one pot three components synthesis of 2,4,5 tri-substituted imidazole derivatives using reactants aldehyde, benzil and ammonium acetate with zinc powder in acetic acid as solvent. Reaction carried out at 50 °C for 60 minutes with different derivatives of aldehyde.

Key Words: MCR, Imidazole, Benzil, Ammonium Acetate, Aldehyde, Acetic acid.

1. Introduction:

Now a day synthesis of organic compound synthesis is challenging task, but due to one pot multi compound reaction i.e. mcr provide important tool for the wide variety of organic molecules. This method having advantages and constructing complex molecules. The presence day, green catalyst and simple organic solvent like water, ethanol, chloroform, acetic acid and acetonitrile uses to satisfying the requirements of environment. Consequently industry still demanding novel and unique methodology and uses of available resources in laboratory. Out of these imadazole is the one of the best mcr product and its derivatives have wide range of biological activity make it importance .imidazole has become an most important element in pharmaceuticals chemistry. Its show properties such as antifungal, antiprotozoal, fungicides and antihypertensive etc. In this paper we report simple mild effective method for preparation of 2, 4, 5, triarylimidazoles by using catalyst Zinc in acetic acid. The reaction carried out by conventional mild heating process up to 40 to 60 mint.

2. Experimental:

2.1 Experimental Section:

All chemical were purchased from Merck, sdfcl 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 -d6 MHz spectrometer

2.2 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 zinc powder (10%mmol) at 50 °c with 8 ml acetic acid as solvent for about 40 mint to 60minut 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.

3: Reaction:

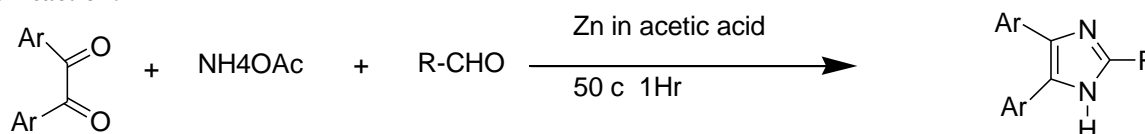


Figure 1: Synthesis of 2,4,5-imidazole catalyzed by zinc powder in acetic acid

Experimental Table 1: One pot synthesis of 2,4,5-tri substituted imadazole using catalyst zinc from various aldehyde

S.No	Aldehyde	Products	Melting Point
1	C ₆ H ₅	80	270-271
2	4-OCH ₃ C ₆ H ₅	80	221-222

3	4-ClC ₆ H ₅	80	260-262
4	3-NO ₂ C ₆ H ₅	60	302-310
5	4-NO ₂ C ₆ H ₅	80	228-230
6	4-NMe ₂ -C ₆ H ₅	75	251-256
7	2-OH-C ₆ H ₅	70	200-205

Spectral and analytical data

- 1) ENTRY 2-2-(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.

3. Result and Discussion:

substituted imidazole and its derivatives synthesis of by using Zinc powder in acetic acid through a condensation in between aldehyde ,benzil, ammonia and ammonium acetate at 50 C gives product. It was found that the catalyst gives good result in between 70% to 80% yield. Encouraged by these expected result, we have used the same methodology on other aldehyde .when aldehyde, benzil and ammonium acetate were investigated. The results as show in table -1

4. Conclusion:

In conclusion we have prepared very simple and efficient method for the good yielding synthesis of 2,4,5- triaryl – 1H- imiazole using zinc as catalyst in acetic acid . By using this catalyst alternative way gives best result in short reaction time.

5. 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.

6. Conflict of Interest:

The author have declared that no conflict of interest exists

References:

1. 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 InCl₃.3H₂O. tetrahedron letters.49(2008)2216-2220
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 irradiationEur.Chem.Bull.2013,2(12),971-974
3. Runxia Wang, Chunsheng Liu and Genxiang Luo. A convenient synthesis of 2,4,5- triarylimidazoles catalyzed by Y(TFA)₃. Green chemistry letters and reviews 2010.vol3. no .2. 101-104.
4. 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.
5. 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
6. S. Fozooni, H. Khoshdast, H. Hassani, H. Hamidian.synthesis of oxazolone and imidazolone derivatives in presence of H₂O₂ promoted fly ash as a novel and efficient catalyst journal of sciences, Islamic republic of iran.2017. 28(3):321-230.
7. Sami Ullah Bhat, Rawoof Ahmad Naikoo,Muzzaffar AhmadMir, Radha Tomar. Synthesis of tetra substituted imidazoles derivatives by condensation reaction using zeolite H-ZSM 22as heterogeneous solid acid catalyst.2016,.vol8.39-39.
8. 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.
9. 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
10. Sondhi S M, Jain S. Dinodia M Kumar A, synthesis of some thiophene imidazole and pyridine derivatives exhibiting good anti inflammatory and analgesic activities. Med.Chem 2008.4.146-54

11. 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-imidazolyl)isoxazoles catalyzed by ceric ammonium nitrate. Indian journal of chemistry .2011.,vol 50B, pp 926-930
12. Heravi M M Bakhtiari.K. Oskooie H.A.Taheri S.J..Mol. Catal A.Chem,2007,263,279