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# Metal Complex Catalyst for Synthesis 5-Alkoxycarbonyl-4-Aryl-3, 4-Dihydropyrimidin-2 (1H) - One Derivatives.

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**Abstract:** *Multi component synthesis of 3, 4-dihydropyrimidinone derivatives utilizing metal complexes is a straightforward, low-cost, readily available catalyst with environmental benefits. Reactions are carried out without using any organic solvents or hazardous substances. Compared to classical Biginelli reaction conditions, this new method synthesis has the advantage of lowering reaction costs, operational hazards, and environmental pollution, while also providing good yields, shorter reaction times, and a simple work-up green approach that does not require any solvents*

**Keywords:** Metal Complex, one-pot multi component synthesis, 3, 4-dihydropyrimidinone, sonication

## I. INTRODUCTION

Multi component synthesis of 3, 4-dihydropyrimidinone derivatives utilizing metal complexes is a straightforward, low-cost, readily available catalyst with environmental benefits. Reactions are carried out without using any organic solvents or hazardous substances. Compared to classical Biginelli reaction conditions, this new method synthesis has the advantage of lowering reaction costs, operational hazards, and environmental pollution, while also providing good yields, shorter reaction times, and a simple work-up green approach that does not require any solvents.

These new strategies involve the combinations of Lewis acids and/or transition metal salts, for example, mineral acid, soil, sand, solid support, montmorillonite (KSF), BF3·OEt2, polyphosphate esters, and reagents like InCl3 [9], CoCl2 [20], TMSCl/NaI [11], ytterbium triflate [17], LaCl3·7H2O [12], CeCl3·7H2O [13], Mn(OAc)3·2H2O [14], In Br [15], LiBr [10], Iodine [18], FeCl3 and HCl [16], ZnCl2 [19], so on. Many Lewis acids and transition metal salts have been found to catalyse this reaction, but they still have drawbacks like very high cost, less yield prolonged heating, and the use of strong acids with very high cost reagents. The combination of different solvents and long reaction time, costly chemicals/catalyst causes many side effects. There is need to develop therefore, very simple, highly efficient, very clean, good yielding, and environmentally friendly approaches using Developing new simple catalysts for the synthesis of these molecules is a critical task for organic chemists. During our investigation to find novel catalysts for multi component reactions, we discovered that Metal Complex is an effective promoter of the Biginelli reaction. applications for the Biginelli reaction, we develop and report for the first time a novel, simple, and efficient methodology for the synthesis of 3, 4-dihydropyrimidin-2(1H)-ones and thiones (DHPMs) by the reaction of aldehydes, 1, 3-dicarbonyl compounds, and urea/thiourea using a catalytic amount of Metal Complex Furthermore, the comparative catalytic effectiveness of lithium-acetate and PPA in catalysing Biginelli condensation is investigated under neat sonication conditions.

## II. EXPERIMENTAL

All products are known compounds and were characterized by their physical and spectra data [10-11].

***Synthesis of 4-aryl-3, 4-dihydropyrimidin-2(1H)-ones: General procedure:***

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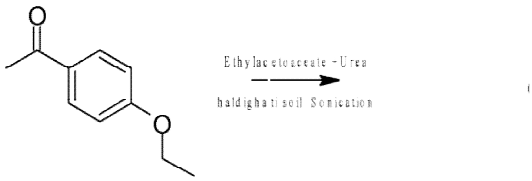
A reaction mixture including aldehyde (10 mmol), beta dicarbonyl compound (10 mmol), urea or thiourea (15 mmol), and metal complex (0.5 g) was solicited for the indicated period. The progression of the reaction (monitored by TLC) the catalyst was separated using simple filtration, and the mixture was chilled to room temperature. The filtrate was poured over icy water. The resultant solid product was filtered and recrystallised from ethanol, yielding the pure products.

## III. REACTION SCHEME




## IV. OBSERVATION TABLE

| Sr. No | Aldehyde | Time in Min | Yield | Physical constant in $^0$C |
|---|---|---|---|---|
| 1 | P-Nitrobenzaldehyde | 122 | 87 | 199 |
| 2 | P-chlorobenzaldehyde | 115 | 88 | 204 |
| 3 | P-methyl Benzaldehyde | 112 | 86 | 212 |
| 4 | P-Methoxy Benzaldehyde | 110 | 84 | 197 |
| 5 | Furfuraldehyde | 102 | 92 | 192 |
| 6 | Benzaldehyde | 105 | 96 | 180 |
| 7 | Cinnaldehyde | 94 | 92 | 221 |
| 8 | M-methyl Benzaldehyde | 103 | 94 | 241 |
| 9 | M-chlorobenzaldehyde | 112 | 88 | 214 |

## V. RESULT AND DISCUSSION

In these years considerable efforts has been placed on more improvement in environmental impact of industrial chemical processes by using different green approaches. It is well known that solids can play a important role in the development of cleaner newer green technologies through their ability to act as catalysts, carry reagents, avoid aqueous work-up using different organic solvents and influence product selectivity. Mostly Aluminosilicate or other metal single or double salt contain clays, which used them efficient, versatile supports or catalysts. While montmorillonite (Bentonite) clays have been very wide use while Kaolin-based reagents or kaolin assisted reactions appear to be very limited and less important in green chemistry and green synthesis.

Kaolin are good replacement due to their acidic nature. It has been used in protection reaction and other organic reactions such as of carbonyl compounds alkylation of benzene and brominating and chlorination of aromatic compounds and various other organic reactions. We used Metal Complex as an efficient catalyst for Biginelli reaction.

Our approaches is not only preserved the simplicity of Biginelli's one-pot reaction, but also consistently yields of dihydropyrimidinones.

The results show that Metal Complex promotes the reaction more effectively than sulphuric acid or other acids. We have found that Metal Complex is a reusable catalyst and even after 7 runs for the Biginelli reaction, the catalytic activity of Metal Complex was almost the same as that of the freshly used catalyst. Catalyst could be separated by a simple filtration and washed with diethyl ether and reused in the same reaction. These reactions with Benzaldehyde and other subsequent were the Benzaldehyde ethyl acetoacetate and urea. The efficiency of acetic acid without catalyst was studied for this reaction.

## V. CONCLUSION

Finally, we established a green technique for the direct synthesis of dihydropyrimidinones with high yields using the Biginelli reaction. The catalyst utilized is recyclable and pricey; hence, this technology may be effective in the production of numerous chemicals in the pharmaceutical industry.

## REFERENCES

[1] S. Achatz and A. Domling, "Desosamine in multi component ¨ reactions," Bioorganic and Medicinal Chemistry Letters, vol. 16, no. 24, pp. 6360–6362, 2006.

[2] W. S. Bremner and M. G. Organ, "Multi component reactions to form heterocycles by microwave-assisted continuous flow organic synthesis," Journal of Combinatorial Chemistry, vol. 9, no. 1, pp. 14–16, 2007.

[3] P. Biginelli, "Synthesis of dihydropyrimidinones," Gazzetta Chimica Italiana, vol. 23, pp. 360–416, 1893.

[4] M. A. AbdulKarim, Al-Kadasi, and G. M. J. Nazeruddin, "An ultrasonic assisted multi component reaction for the synthesis of 3, 4-dihydropyrimidin-2(1H)-ones under solvent-free condition," Journal of Chemical and Pharmaceutical Research, vol. 2, no. 3, pp. 536–543, 2010.

[5] F. Toda, K. Tanaka, and A. Sekikawa, "Host-guest complex formation by a solid-solid reaction," Journal of the Chemical Society, Chemical Communications, no. 4, pp. 279–280, 1987.

[6] A. K. Bose, S. Pednekar, S. N. Ganguly, G. Chakraborty, and M. S. Manhas, "A simplified green chemistry approach to the Biginelli reaction using "Grindstone Chemistry"," Tetrahedron Letters, vol. 45, no. 45, pp. 8351–8353, 2004.

[7] G. Nagendrappa, "Organic synthesis under solvent-free condition: an environmentally benign procedure–I," Resonance, vol. 7, no. 10, pp. 59–68, 2002.

[8] Gurumeet C. Wadhawa, Dinanath D. Patil, Dnyandeo K. Mhaske Facile regeneration of carbonyl compounds from 2, 4dinitrophenylhydrazones, oxides, hydrazones, and semi carbazones

[9] Gurumeet C. Wadhawa, Dinanath D. Patil , Dnyandeo K. Mhaske Synthesis and screening of antimicrobial activity of N-(3 cyano-6-phenothazie -10yl-4-phenyl –pyridine -2yl) actamide Derivatives Organic Chemistry an Indian Journal Vol.8 (5) 2012 179-182, ISSN 0974-7516

[10]Dinanath D. Patil, Dnyandeo K. Mhaske Gurumeet C. Wadhawa Zinc sulphate as an efficient and eco friendly catalyst for the one pot multi component synthesis of beta acetamido ketones under mild and heterogeneous condition and their microbial activity international journal of institutional pharmacy and life sciences 1(3) 2011 ,22-29 ISSN 2249-6807

[11] Dinanath D. Patil, Dnyandeo K. Mhaske Gurumeet C. Wadhawa Antioxidant effect of stem and leaves of erythrinaindica Lam. international journal of institutional pharmacy and life sciences 1(3) 2011 ,30-35 ISSN 2249-6807

[12] Patil D.D., Mhaske D.K., and Wadhawa G.C Antibacterial,. Antioxidant, anti inflammatory study of leaves and bark of cassia fistula international journal of pharmacy Vol-2(1), (2012), 401-405, ISSN 2249-1848

[13] Patil D.D., Wadhawa G.C one pot synthesis of nitriles from aldehydes and hydroxylamine hydrochloride using sodium sulphate sulphate in dmf under reflux condition world journal of pharmacy and pharmaceutical sciences Vol 3 issue 1,(2012) 592-595,ISSN 2278-4357

[14] Dinanath Patil, Dnyandeo Mhaske, Gurumeet Wadhawa Mild and efficient synthesis Benzimidazole by zinc acetate under solvent free condition Advance material in industry 1 (1).(2015) 13-15 978-81-920431-1-1

[15] Dinanath Patil Dnyandeo Mhaske, Gurumeet Wadhawa Synthesis and antimicrobial study of some Benzimidazole derivative Advance material in industry 1 (1). (2015), 1-5 978-81-920431-1-1

[16] Dinanath Patil, Gurumeet Wadhawa Zinc sulphate catalysed 2 aryl Benzimidazole under sonication Unique Research Journal of chemistry (URJC) 01 (01) (2013), 55-56, ISSN 2249-7692