ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 12, Issue, 01, pp. 53115-53117, January, 2022
https://doi.org/10.37118/ijdr.23710.01.2022

REVIEW ARTICLE OPEN ACCESS

GREEN SYNTHESIS - MORE TECHNIQUE AN ECOFRIENDLY TECHNOLOGY

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ARTICLE INFO

Article History:
Received 27th October, 2021
Received in revised form
09th November, 2021
Accepted 16th December, 2021
Published online 28th January, 2022

Key Words:
Intrinsic hazardous,
Ecofriendly, Economic efficiency.

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ABSTRACT

Green chemistry is the design of chemical products and eliminate the use of generation of hazardous substances. Green chemistry applies across the life cycle of a chemical product, including its design, manufacture, use & ultimate disposal. Green chemistry reduces pollution at its source by minimizing or eliminating the hazards of chemical feedstock's reagents, solvents & products. It an emerging techniques that could make industrially important and more ecofriendly than conventional reactions "Green chemistry, design chemical and processes to reduce their intrinsic hazardous and increase economic efficiency.

Citation: ***Monal Singh.*** "Green synthesis - more technique an ecofriendly technology*", International Journal of Development Research*, 12, (01), 53115-53117.

INTRODUCTION

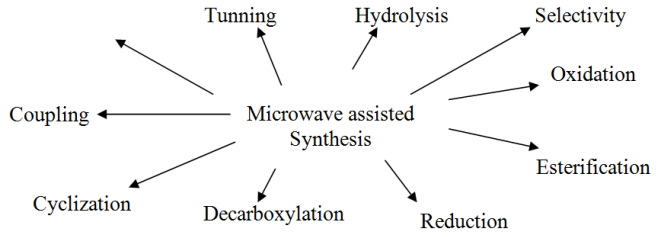
Green chemistry is a design of chemical products which reduce or eliminate the hazardous substances. Green chemistry and sustainability are both sides of the coin. Development of chemicals, polymers, dyes, fertilizers, fibres, pharmaceuticals materials have drastically change human lives. The usages and production of these chemicals may involves reduced waste products and toxic components. Green Chemistry an emerging techniques that could make industrially important and more ecofriendly than conventional reactions. Green technology prevent waste less hazardous chemical synthesis, safer solvents and reactions conditions increase energy efficiency, design chemicals and products to degrade after use and minimize potential for accidents. Green Chemistry design chemical product and processes to reduce their intrinsic hazards.

Twelve principles of Green chemistry

1- Prevent waste
2- Maximize atom economy
3- Design safer chemicals and products
4- Design less hazardous chemical synthesis
5- Use safer solvents and reaction condition
6- Increase energy efficiency
7- Use renewable feed stocks
8- Avoid chemical derivatives
9- Use catalyst, not stoichiometric reagents
10- Design chemicals and products to degrade after use.
11- Analyze in real time to prevent pollution
12- Minimize the potential for accidents[1]

Implementation of green chemistry principles helps to attain environmental, economic as well as social goals. MORE (microwave induced organic reaction enhancement) techniques are potentially valuable as they reduce the need for organic solvents and also increase "atom economy" by improving product selectivity and chemical yield. The method displays both economic and environmental advantages. High yield are achieved even on a gram scale. Reaction time is considerably shortened. ceric ammonium nitrate has been found to be an efficient catalyst for solid phase green synthesis of amide derivatives of substituted carboxylic acid with urea in excellent yields under microwave irradiation condition[2]. Amines play a key role in the pharmaceuticals manufacturing process as well as the formation of the main association in proteins, amides represent a very well known brand drugs example "Atrovastatin" blocks the production of cholosterol[3] "Lisinopril" inhibitor of angiotension enzyme[4], "Dilitiazem" Calcium channel blocker[5], "Valsartan" blockade of a angiotension receptors[6] Direct interaction between the carboxyl group and amine to prepare amides requires heating up more than 200°C to get rid of water generated [7-9] Therefore it requires, first convert the hydroxyl group to a good leaving group before adding it to the amine was to transferred to the ester group as an intermediate and then synthesis of amines[10]. A magic of microwave heating technique turned the Bunsen burner of the 21st century, has emerged as a valuable alternative in the synthesis of organic compounds, polymers, inorganic materials and nanomaterials. Important innovations in MW (microwave) assisted chemistry now enable chemists to prepare catalytic materials or nanomaterials and desired organic molecules, selectively in almost quantitative yield and with greater precision than using conventional heating. By controlling the specific MW parameters such as temperature, pressure and ramping

of temperature, choice of solvents a advanced design & development can be done".



Designing a green synthesis[12]:-

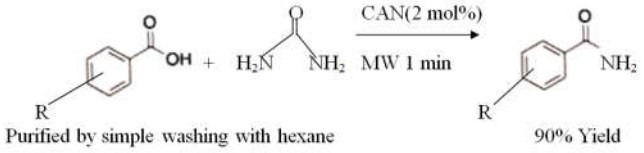
- Choice of starting materials
- Choice of reagents
- Choice of catalysts
- Choice of solvents

All these forms the basis of Green chemistry-the Pressing field of all nations which is having role in day to day life, environmental pollution green reagents and catalysts, phase transfer catalysts in green synthesis MORE is a promising area of modern green chemistry could be adopted to save the earth. Ceric ammonium nitrate provides both an unexpensive and non-toxic green solution to the synthesis of many amide derivatives of pharmaceuticals uses[2]. Microwave may be considered as more efficient sources of heating then conventional systems. The reaction in solid phase occur more efficiently and more selectively compared to reactions carried out in solvents, green processes have resulted through use of less or no catalyst. Reactions are simple to handle reduce pollution, comparatively cheaper to operate and are especially important in pharmaceuticals industry. Among lanthanides reagents, cerium (IV) ammonium nitrate is one of the most important catalyst in organic synthesis [13-14]

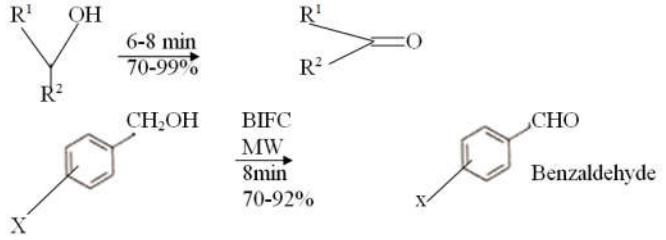
Aspects of microwave assisted organic synthesis as an interdisplinary research field:-

Reaction of Benzoic acid with urea[2]:

In presence of ceric ammonium mitrate (2mol %) under microwave give 90% yield in 1 minute.

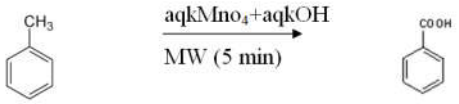


Oxidation of secondary alcohols and acetone derivative: Using PCC, tetrabutyl ammoniumbromide and dichloromethane under microwave irridation (6 min) products were isolated (70-99% yield) oxidation of benzoyl alcohols was conducted using BIFC under microwave irridation giving benzaldehyde derivatives in 70-92% yields [15]-

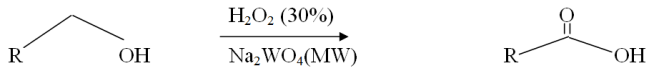


[Note: PCC-Pyridinium chlorochromate is reagent in organic synthesis using primarily for oxidation of alcohols to form carbonyls (yellow orange salt.)] [BIFC = Bimolecular fluorescence complementation for protein interaction in living cell]

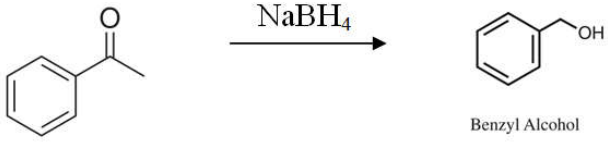
3. Oxidation of toluene[16] :- With $KMno_4$ 5 Min and yield is 40%



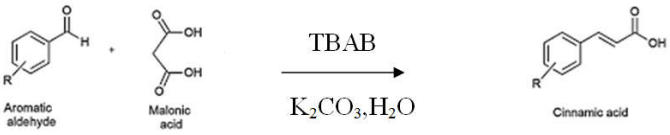
4. Primary alcohols oxidize to carboxylic acid[16]: Using sodium tungstate as catalysts in 30% aqueous hydrogen peroxide.



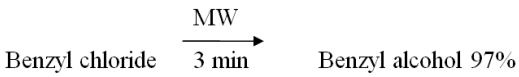
5. Reduction of Acetophenone[17]: in presence of NaBH4 in microwave 92% yield of benzyl alcohol in 2 min.



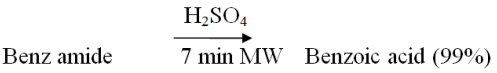
6. Knoevenagel condensation[18] : applied in synthesis of unsaturated acids used as precursors for perfumes, flavonoids, carbonyl compounds and active methylene- compounds viz malonic acid, using tetrabutyl- ammonium bromide, potassium carbonate in water forming unsaturated acid in microwave.



7. Hydrolysis of benzyl chloride[19]: In presence with water in microwave gives 97% yield of benzyl alcohol in 3 min, usual hydrolysis in normal way takes 35 min.



8. Hydrolysis of Benzamide[19]: Usually benzamide takes 1hr, under microwave conditions hydrolysis is completed in 7 min giving 99% yield of Benzoic acid.



9. Esterification of Benzoic acid and n-propanol[20] Mixture of Both heating in microwave for 6 min in presence of sulfuric acid gives propylbenzoate.

10. Decarboxylation of Carboxylic acids[21]:- Refluxing in quinoline in presence of copper chromate take shorter time.

11. Deacetylation of aldehydes, phenol and alcohols[22]:- These are protected by acetylation and product is carried under acidic or basic conditions process takes long time and yields are low. use of microwave irridation reduces time and yield are good.

12. Mannich base derivatives[23]: In microwave irridiation good yield were obtained widely applied in pharmaceuticals industry, for drug discovery and development.

Microwave assisted synthesis in Interdisciplinary research field[24]:- Microwave assisted extractions of raw materials from natural sources finding new lead structures for pharmaceuticals and other active agents, extraction processes for compounds from natural materials have gained significant importance.

(1) **Esterification of linalool with carboxylic acid anhydride:-** the use of microwave energy for the esterification of linalool with different carboxylic acid anhydrides.

(2) Microwave power applications in industry[25]:- Research highlights on successful branching of electromagnetic software tools and hardware design. Procedures from their classical telecommunications background into a diversified world of microwave processing of food chemicals & minerals.

(3) Synthesis and characterisation of cellulose /hydroxyapatite[26]:- Synthesis of hydroxyapatite (HA) on cellulose fibres to be used as a new reinforcing agent for dental restorations. Microwave irridiation method was used for synthesis. Results suggested that HA could be successfully synthesized on cellulose fibres using microwave irridation and contribute to improving the mechanical properties of dental resin composites.

(4) Microwave assisted synthesis of Glucopolymers[27]:- Copolymers of 2- methacrylamido), glucopyranose (MAG) and methacrylic acid (MAA) are synthesized by RAFT polymerization and then used as templates to prepare glycopolymers- functionalized Ag nano clusters (Gly-Ag NCs) through microwave irradiation indicating their potential biological applications for both cancer imaging and targeted cancer therapy.

(5) Microwave approach to the selective synthesis of ω. laurolactam[28]:- Beckmann rearrangement of cyclodecanone oxime, the monomer for the production of Nylon 12, was accomplished using wide range of micro-mesoporus catalysts under microwave conditions affording the selective production of ω-laurolactam in 5 min.

(6) Recently (COFs) are emerging group of microporus materials and increases attention in the field of sample pretreatment due to their advantages such as high surface area, tunable pore size, good chemical selectivity and thermal stability.

(7) **Microwave accelerated drug synthesis[29-31]** Drug therapies for various diseases are developed based on their biological targets and it is time consuming and expensive. So it is thought of interest towards technologies that allow rapid synthesis and screening of chemical substances to identify lead compounds with suitable potency and less toxicity. Thus microwave accelerated drug synthesis [MADs] is considered as an emerging green technology with environmental friendly chemical processes in medicinal chemistry. Most of the drug synthesis proceed faster with higher yields under microwave irridiation as compared to conventional heating method, microwave technology possess several advantages such as high efficiency yield, selectivity, easy seperation & purification.

This methods is no times one pot synthesis and is a boon for developing pharmaceutical industry in India. The N- substituted benzamide derivatives have been reviewed for antibacterial, anti-inflammatory, analgesic and antiulcer actions[32].

Conclusions

In past few years, using microwave energy to heat and drive chemicals reactions has become increasingly popular in the medicinal chemistry community. Many advantages of using rapid microwave technique for chemical synthesis is the dramatic reduction in reaction time from days and hours to minutes and seconds[33].Comparison between conventional and microwave assisted synthesis was done by microwave assisted synthesis leads to higher yield within very short reaction times.[31]. Pharmaceuticals composition of amide derivatives are used as, therapeutic agents for hypertension, angina, pectoris, asthma, renal and periperal circulatory disturbances for and inhibitiors of vasopasm[2].

REFERENCES

Ananthanarayan, S, Tetreault, S., Saint Jean A interaction of calcium channel antagonists with calcium. *J. Med. chem,* 36, 1324-1332, (1993)

Anastas P.T. and J. warner, Green chemistry theory and practice, Oxford University press oxford (1998).

Anjali T. Pusp R.S.G. et.al. Design synthesis, SAR Docking and antibacterial evaluation, *Journal of chem. Tech. Research,* 9,3, 575-588, (2016).

Brittany L. Hayes. Life sciences division. vol. 37, No. 2, (2004)

Degaspara, M. white bread, S binding of valsartan to mammalian angiotensin AT I receptors Regul. pept. 59,303-311, (1995)

Deng, R.Y. wang, Y. Irang, synth. commun., 24, 111-115, (1994)

Gabrial, C. S Gabriel, et.al. chem. soc. Rev. (1998)

Gedye, R. Smith R, westaway K, et. al. Tetrahedron letters, 27:279-282 (1986)

Graul, A et al. Drugs future. 22, 956-958, (1997).

Gupta, M B.P. wakhloo, Arkivoc, 15, 94-98, (2007)

Gwarek, W.K. M. celuch-Marcysiak, IEEE Xplore, 7-8, (2004)

Hardik M, Ranjan, K, Synthesis and studies of some substituted pyrimindines. *International Journal of chem. Tech-Research,* 01, 275-277. (2015)

Hyatt, J.A. Liquid and supercooled carbondioxide as organic solvents. J. Ani. chem. Soc. 49, 5097-510, (1986)

Irang, Z.L. Z.W. Feng, X.C. Shen, Chin. Chem. Lett. 12,551-554 (2001)

Jacob, *J. Int. J. Chem*, 4, 29-43, (2012)

Kappe CO, Dallinger, D, Nature review of drug discovery, 5:51-63 (2006)

Maddi, V. S.N. Mamledesai, D.et. al., *Indian J. Pharm Sci.* 69, 847, (2007)

Manoj B- Gawande, et al. Microwave assisted chemistry synthetic applications for rapid assembly of nanoparticles and organics. American chemical society, 47, 4, 1338-1348, (2014)

Muhammad Sabit, Asif Ali, et al. *Journal of Biomaterials science,* vol 31, issue 14, (2020)

Neerja Gupta and Monal Singh, Microwave assisted high speed chemistry, A new technology for Pharma-ceutical Industry. Asian Journal of chemistry vol 24, No. 12 5937-5938, (2012).

Niichter, M B. ondruschka, et al. *Royal Society of Chemistry.* 6, 128-141 (2004)

Niichter, M. B. Ondruschka et al. *Royal Society of Chemistry*, 6, 128-141, (2004).

Oliver Kappe C. and Doris Dallinger. The impact of microwave synthesis on drug discovery. C-oliver kappe & Doris Dallinger 5:51-63, (2006)

Patlchett, A; Excursions in drug discovery*, J.Med, Chem.* 36, 2051-2058. (1993)

Pechiamma M, Leena S, Ravichandrans, synthesis characterization and screening of antimicrobral activity of metal complexes derived from the mannich base. *International Journals of Chem. Tech. research.* 7,01-287-292- (2015)

Peterson, S.L. A.P. Tofteng, et.al. chem. soc. Rev. 41, 1826, (2012)

Polshettiwar, V. M.N. Nadagouda, R.S. Varma, Aust. J chem. 62, 16-26, (2009)

Ravichandran, S. E. Karthikeyan, *Int. J. Chem. Tech. Research,* 3, 466-470, (2011)

Shah J.J and Krishnapriya Mohanraj. Indian Journal of Pharmaceutical sciences 76(1):46-53, (2014)

Sreeram, K.J. M. Nidhim, B.V. Nair et al, 31, 937-942, (2008).

Thatham J, Md. Afzal, A design and synthesis of Dual inhibitors. *Journal of chem. Tech. research.* 7, No-2, pp. 711-715, (2015)

Thomsan D. conesa, Jaun M, campelo, et. al. A microwave approach to the selective synthesis of ω- laurolactam. issue 10, (2007)

WeiLu, wenjuna Ma, et al. Microwave assisted synthesis of glucopolymers. Page 827-833, vol 35 issue 8, (2014)