RESEARCHERID
THOMSON REUTERS

[Choudhary, 5(4): April 2018]

ISSN 2348 – 8034
Impact Factor- 5.070

GLOBAL JOURNAL OF ENGINEERING SCIENCE AND RESEARCHES

GREEN CHEMISTRY

VISHAKHA CHOUDHARY[1] and PREETAM[2]
Department of Applied sciences and Humanities, Ganga Technical Campus (India)

ABSTRACT

Today some reactions in pharmaceutical and medicinal chemistry laboratories are harmful to our environment and hence some steps should be taken to overcome it. So a new branch i.e. GREEN CHEMISTRY is introduced. This article basically discusses the basic concept of green chemical reaction. Green chemistry is designed in such a way so as to reduce or eliminate the harmful impacts on the environment so that the use of toxic, waste product reduces and hence there is an increase in the use of non-toxic components and improved its efficiency.

Green chemistry is not a new concept of technology but its focus on the design of chemical products and processes involved in a reaction. The most simple method to apply green chemistry in pharmaceuticals is to utilize eco-friendly, non-hazardous, reproducible and efficient solvents and catalysts in the synthesis of drug molecules, drug intermediates and in researchers involving synthetic chemistry. Chemist and medicinal scientist can reduce the risk of human health and the environment by following all the principles of green chemistry. A brief history, introduction and application of green chemistry are also mentioned.

Keywords: *Green chemistry.*

I. INTRODUCTION

Green chemistry is an interdisciplinary field, drawing on knowledge from chemistry, Chemical engineering, toxicity and ecology. The term green chemistry was first introduced by P.T. Anastas in 1991 in a special program launched by US environmental protection agency to implement sustainable development in chemistry and chemical technology by industry, academia and government. green chemistry gives a new way of thinking towards preparation, processing and application of chemical substances so as to reduce harm to human and environment. pharmaceuticals industries and chemical industries are producing much more waste which is not good for environment and nature. The green chemistry offers environmentally beneficial alternatives so as to reduce the effect of hazardous chemical and processes.

II. PRINCLIPLES OF GREEN CHMISTRY

There are generally 12 basic principles of green chemistry that help chemist to understand it and find ways to implement green chemistry in today's life.

1. Prevention: it is better to avoid waste rather than cleaning or treating waste after it has been created.

2. Atom economy: synthetic method must be designed to maximize the incorporation of all materials which is used in process undergoes final product.

3. Less hazardous chemical synthesis: wherever applicable, the synthetic method should be designated to use and try to generate substances that give less or have no toxic effect on human health.

4. Designing safer chemicals: chemical products should be designed in such a way that it should have to minimize the toxicity and perform their desired function.

5. Safer solvents: the use of unnecessary substances should be avoided and if possible, offensive should be used.

6. Design for energy efficiency: during chemical processes, energy should be recognized and hence minimized for the environment and economic impacts.

7. Use of renewable feedstock's: whenever technically and economically applicable, raw material or feedstocks should be used again and again rather than depleting it.

8. Reduce derivatives: unnecessary derivation should be minimized or avoided so as to reduce additional reagents which generate unwanted waste.

9. Catalysis: catalysis should be selective in nature rather than stoichiometric reagents.

10. Degradation design: chemical products should be designed in such a way that they break down into harmless degradation products after completion of their function and prevent the environment from unwanted waste.

11. Real-time analysis for pollution prevention: Analytical methods need to be developed more so that they get more time in monitoring and controlling prior to the formation of hazardous substances.

12. Accident prevention: substances and their derivatives which are used in a chemical process should be chosen so as to reduce chemical accidents including releases, explosions and fires.

III. IMPLEMENTATION OF GREEN CHMISTRY

The implementation of green chemistry involves reconsideration of the economic viability of process by taking into account the environmental hazards associated with the process. This may require a review of reagents including solvents, by-products, catalyst i.e. these are 3 most important component of a chemical reaction which take part to form the desired product.

Catalyst: green catalyst plays a very important role in chemical reactions by replacing reagents, by enabling more efficient processes, by reducing the costs of the process. This can be achieved by designing the appropriate catalyst, which could be cheap, easily prepared and reproduced and has no harmful effect on the environment.

It is observed that chloroauric acid(HAuCl4), a catalyst which is used in water for stereoselective cycloisomerization of variously functionalized allenes to five or six-membered oxygen or nitrogen-containing heterocyclic. As compared to another old catalyst, this catalyst is more environment-friendly and can be used again and again after complete conversion of the substrate .Zeolite catalyst, crystalline alumina silicates with exchangeable cations is another example of green chemistry catalyst. Zeolite catalyst has a wide range of application in acid, catalysed reaction such as alkylation, acylation, electrophilic aromatic, cyclization, isomerization and condensation.

Solvents: Solvents explains a major portion of the environmental performance of a process. it also affects safety and health issues. In the industry, selection of solvents for chemical processes and subsequently the waste-solvent management are based on economic, safety and logistical considerations.

The pharmaceutical industry has made significant efforts to identify organic solvents those have a less ecological footprint as compared to traditional reactions. There are several types of green solvents such as water, liquid polymers, ionic liquids, bio-ethanol, supercritical fluids and ethyl lactate. Capello et al give a result on a comprehensive framework that from 26 organic solvents, only simple alcohols (methanol, ethanol) or alkanes (heptane, hexane) are environmentally preferable solvents, whereas the use of dioxane, acetonitrile, acids, formaldehyde and tetrahydrofuran are not recommendable as they have an adverse effect on environment. Other results also state that methanol-water or ethanol-water mixtures are environmentally favourable compared to pure alcohol or propanol–water mixtures.

IV. CONCLUSION

Green chemistry focus on preparing the product which are less toxic and have no adverse effect on environment and human health. It is the new branch of chemistry which helps in removing the pollution from environment .With the help of this concept we can easily reduce the production of waste materials. Medicinal companies and researcher should encourage themselves to apply the principle of green chemistry at the time of choosing and processing reagents and solvents.

REFERENCES

1. *Sheldon RA. Catalysis: The Key to Waste Minimization. J Chem Tech Biotechnol 1997;68(4):381–388*

2. *Noyori R. Pursuing practical elegance in chemical synthesis.Chemical Communications 2005;14:1807–1811*

3. *Chemistry for the Environment. Interuniversity Consortium.http://www.incaweb.org/.*

4. *Green & Sustainable Chemistry Network, Japan. Green & Sustainable Chemistry Network. http://www.gscn.net/aboutE/index.html*

5. *Anastas PT, Warner JC. Green Chemistry: Theory and Practice, Oxford University Press: New York, 1998, p.30.*

6. *Glaze WH. Sustainability engineering and green chemistry.Env Sci Technol 2000;34:449A*

7. *Winterton N. Twelve more green chemistry principles? Green Chem 2001;3: G73–G75*

8. *Seyler CC, Hellweg S, Bruder B et al. Waste-Solvent Management as an Element of Green Chemistry: A Comprehensive Study on the Swiss Chemical Industry. Ind Eng Chem Res 2006;45:7700–7709*

9. *Walter L. Green Solvents–Progress in science and application.Green Chem 2009;11:603*

10. *Christian CF and Konrad H.What is a green solvent? A comprehensive framework for the environmental assessment of solvents. Green Chem 2007;9:927–934*

11. *Mustafa JR, Veerababurao K, Chun-Wei K, Raju R and Ching-Fa Y. On-water synthesis of chrome no-isoxazoles mediated by [hydroxy(tosyloxy)iodo]benzene(HTIB) Green Chem 2010;12:1090-1096*

12. *Akira S, Takeshi S, Shinichiro T, Mitsuru U, Nobuhiro and Tomohito K. An efficient synthesis of glyceryl ethers: catalyst-free hydrolysis of glycidyl ethers in water media. Green Chem 2009;11:753-755*