



EXPERIMENTAL EVALUATION OF GREEN APPROACH IN ORGANIC SYNTHESIS

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ABSTRACT

Boundless utilization of chemical and transfer of chemical waste makes nature polluted. To stay away from or limit the harm of condition; green techniques are utilized in different organic synthesis. Green techniques have significant ecological and economical favorable circumstances over traditional engineered forms. In this, some green techniques, for example, multi-part reactions, green solvents, green catalysis, microwave and ultra-sonications reactions are talked about. The present research work entitled "Green Approach in Chemical Reactions-Nitration, Halogenation and Redox Reactions" has been attempted to give contact of Green Chemistry to some the reactions being led in Chemistry Practical Course and to limit the time, introduction to toxic chemicals, cost and pollution obliges.

KEYWORDS: Green Chemistry, Green Initiatives

INTRODUCTION

Tidying up the environment and, all the more critically, anticipating pollution are significant issues in this day and age. It was noticed that natives are winding up increasingly more mindful of the risks related with scientific advancement. There is the need for science to give solutions to stressing problems, moving toward capable research examining risk and safety measure. Scientific associations as IUPAC and the Organization for Economic Co-task and Development (OECD) use their global point of view to contribute toward the improvement of education in the field of Sustainable Chemistry and advance the public comprehension of scientific methods and new advances for a sustainable development. In 1990, Dr. John Warner and Paul D Anastas (U.S.A.) have instituted the term Green Chemistry as a field of growing environmentally generous chemical products and procedures inside the settings of sustainable assets . So as to regard this idea, in

1991, the Environmental Protection Agency (EPA) has presented Green Chemistry. Green Chemistry is the plan of chemical products and procedures that diminishes or dispenses with the utilization and age of unsafe substances Green Chemistry has illustrated, through the span of the previous decade, how crucial scientific methodologies can secure human health and the environment in an economically helpful way. Noteworthy advancement is being made in a few key research regions, for example, catalysis, the development of inexhaustible feed stocks and the plan of safer chemicals and environmentally benevolent solvents.

Green Chemistry has promptly won approvals. In 1991 in truth the OPPT (Office of Pollution Preventing and Toxics) in the USA propelled the main research activity of Green Chemistry Program. This program gave uncommon awards to research extends



that incorporate pollution anticipation in the plan and synthesis of chemicals.

In 1993 the EPA in the wake of receiving the name "U.S. Green Chemistry Program" has filled in as a point of convergence for real exercises inside the United States, for example, the Presidential Green Chemistry Challenge Award and the yearly Green Chemistry and Engineering Conference. In Europe, in the primary portion of the 1990s, both Italy and United Kingdom propelled significant activities in green chemistry: in Italy, an interuniversity consortium included research on green chemistry as one of its focal subjects and in United Kingdom a few researchers set up research and education programs in green chemistry. In the course of the most recent 10 years likewise Japan has been included on green chemistry topic and sorted out the Green and Sustainable Chemistry Networks (GSCN) to advance news research on green and sustainable chemistry. Singh M.M. et. al. have appropriately characterized Green Chemistry as utilization of chemistry procedures and methodologies that decrease the utilization or kill the age of products and byproducts that are perilous to human health and environment.

In 1999, with regards to the high number of publications on the sustainable chemistry, the Royal Society of Chemistry introduced the Green Chemistry Journal. Presently multi day numerous countries as Italy, Kingdom, Japan, Australia and others, have received green chemistry awards to feature the environmental and economic achievements of green chemistry.

PRINCIPLES OF GREEN CHEMISTRY

The structure of new chemical products, the development of new eco-accommodating procedures and also the disposal or decrease of

utilization and age of perilous substances suggest the utilization of a lot of criteria, principles and methodologies that have been utilized as rules by molecular researchers. These principles note as The 12 principles of Green Chemistry, are an order of the crucial methodologies taken to accomplish the green chemistry objectives of kindhearted products and procedures.

1. Avoid waste: It's smarter to forestall waste than to treat or tidy up waste after it is shaped.
2. Molecule Economy: Synthetic methods ought to be intended to amplify fuse of all materials utilized in the process into the last item.
3. Less Hazardous Chemical Synthesis: Wherever practicable, engineered methodologies ought to be intended to utilize and create substances that have practically zero toxicity to human health and the environment.
4. Designing Safer Chemicals: Chemical products ought to be intended to save adequacy of capacity while lessening toxicity.
5. Safer Solvents and Auxiliaries: The utilization of helper substances (for example solvents, partition specialists, and so on.) ought to be made pointless at every possible opportunity and harmless when utilized.
6. Structure for Energy Efficiency: Energy prerequisites ought to be perceived for their environmental and economic effects and ought to be limited. Manufactured methods ought to be directed at encompassing temperature and weight.
7. Utilize inexhaustible feedstock: A crude material of feedstock ought to be sustainable instead of exhausting any place actually and economically practicable.



8. Diminish Derivatives: Unnecessary derivatization (blocking gathering, protection/deprotection, brief adjustment of physical/chemical procedures) ought to be stayed away from at whatever point conceivable.
9. Use impetuses, not stoichiometric reagents: Catalytic reagents (as specific as could be expected under the circumstances) are better than stoichiometric reagents.
10. Plan chemicals and products to corrupt after use: Chemical products ought to be structured so that toward the finish of their capacity they don't endure in the environment and separate harmless debasement products.
11. Investigate continuously to anticipate pollution: Analytical methodologies should be additionally created to consider constant, in procedure observing and control preceding the development of unsafe substances.
12. Accident prevention: Substances and the type of a substances utilized in a chemical procedure ought to be picked to limit the potential for chemical accidents, including discharges, blasts and flames.

GREEN INITIATIVES IN CHEMICAL RESEARCH

Chemical generation is an unavoidable and unending movement as the living creatures are such a great amount of familiar with the assortment of chemicals so as to make presence simple and agreeable.

Anyway during chemical generation action the environment had experienced chemical pollution. With the presentation of Green Chemistry, the research scientific experts are moved to the topic of ensuring the

environment through propelling green activities in chemical research. The research is engaged to cover the vast majority of the Principles of Green Chemistry. Following models will clarify the equivalent.

1. Prevention-Since chemical procedures make waste, the executives of this waste is a significant issue. Age of waste can be seen as a wasteful utilization of assets that will thus result in a less economically alluring procedure. The most alluring approach to oversee waste is along these lines to forestall it as opposed to tidy it up. It very well may be accomplished through control of procedure factors, and staying away from over the top utilization of reagents and solvents in procedure and work-up.

2. Molecule Economy-The idea of particle economy as created by Barry Mist thinks about the amount of the reactants in a chemical response end up in the last valuable item or products. With selectivity and yield being the prime worry in the regions of fine chemicals, pharmaceuticals and scholastics, the effective utilization of reactants from the outlook of iota economy is frequently overlooked. At the point when these reactants are utilized wastefully their iotas end up, partially, as waste byproducts of the response. The objective of molecule economy is to make unions in which a large portion of the iotas of the reactants become joined into the ideal last item prompting less waste byproducts. The degree with which the iotas in the reactants get consolidated into conclusive item is named as particle economy. The idea of iota economy was measured by Sheldon (Professor at Delft University, Netherlands). He determined rate particle use by separating the molecular load of the ideal item by the molecular loads of the considerable number of products created in a response.



$$\% \text{ Atom Utilization} = \frac{\text{Molecular Weight of desired product}}{\text{Molecular Weighth of (Desired Product +Waste Product)}} \times 100$$

However, in some reactions two or more products (isomeric or different) may be

obtained. In that case % AUR can be calculated as follows.

$$\% \text{ AUR} = \frac{(\sum N_p W_p)}{[(\sum N_p W_p) + (\sum N_r W_r)]} \times 100$$

Where,

N_p = Number of molecules of Product

N_r = Number of molecules of Residue/s

W_p = Formula Weight of Product/s

W_r = Formula Weight of Residue/s

ORGANIC CHEMISTRY

Organic chemistry is the cornerstone of many sub-disciplines including medicinal chemistry, bioorganic, polymer, organometallic and physical organic chemistries. In addition, the organic chemists have strong affiliations with the chemical biologists as well as with members of other disciplines including material science, chemical engineering, catalysis, and molecular and cell biology. In the modern society,

knowledge in organic chemistry is very essential as the organic synthetic products serve as plastics, drugs, pharmaceuticals, pesticides, nanomolecular devices, food additives, pigments, flavoring agents, fibers, clothing, petrochemicals, explosives and paints. All the key molecules of life, such as DNA, proteins, lipids and carbohydrates are composed of organic compounds and furnishing the energy that sustains life

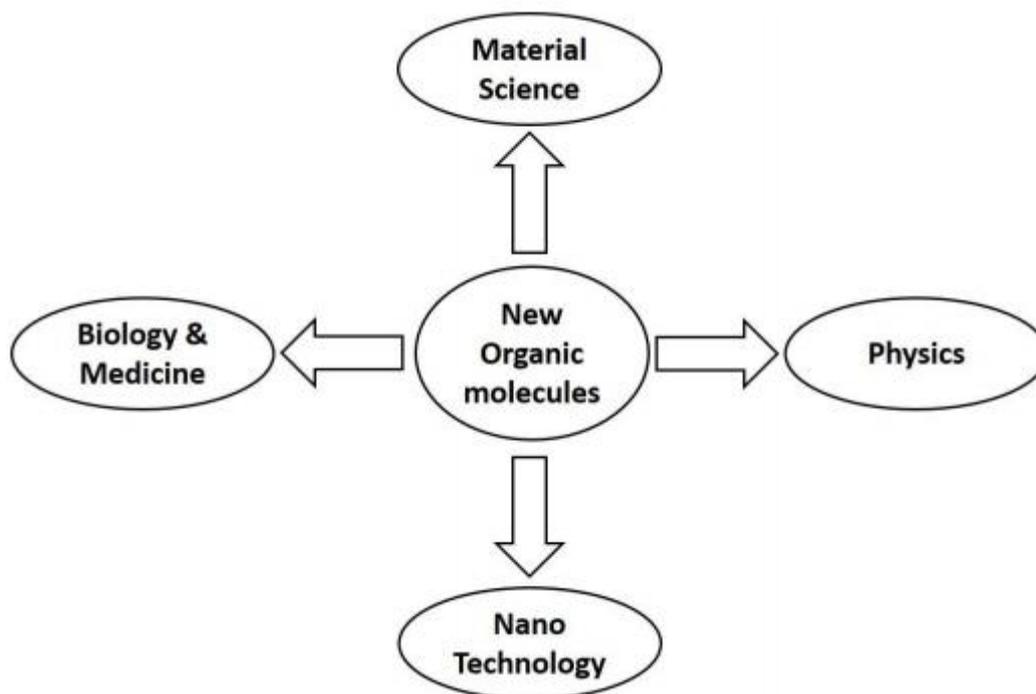


Fig Organic Chemistry

ORGANIC SYNTHESIS

The engineered organic chemistry is the craft of structure up of complex organic molecules from littler and effectively open chemical substances. Organic synthesis is a branch of chemical synthesis and is basic for the development of organic mixes by means of organic responses. Organic synthesis is considered as a broad, most energizing and significant disclosures of the twentieth century in chemistry, biology, and prescription which fill in as a fuel for the medication revelation and development of bioactive mixes with various procedures that are connected for new biomedical disclosures and applications. After the World War II, synthesis of a progression of complex molecules was accomplished by the accessibility of all the more dominant calculated procedures.

Today, organic synthesis is centered around the down to earth and a la mode methodology

for the synthesis of naturally significant target molecules which incorporates the disclosure and development of new manufactured procedures and innovations; and investigations in chemical biology through molecular structure and unthinking examinations. Future walks in the field are probably going to be helped by the advances in the segregation and portrayal of novel molecular focuses from nature, the accessibility of new reagents and engineered methods, and data and mechanization advances. In mid-eighteenth century, mixes created from living things were progressively hard to separate, purge and handle than mixes acquired from the minerals. The establishment of organic synthesis was occurred in the nineteenth century when Wohler blended the principal characteristic item urea (organic compound) from an inorganic substance ammonium cyanate (NH_4CNO) in the year 1828. 1 This occasion set to rest the visvitalis (fundamental power) hypothesis which expressed that any substance

disengaged from a living being can't be created artificially.

From the revelation of urea by a manufactured strategy, gigantic criticalness has been paid for the synthesis of all the organic mixes in the research facility. The synthesis of acidic acid by Kolbe in 1845 was the second real accomplishment in the history of organic synthesis.² It is generally huge, in light of the fact that just because Kolbe utilized "Synthesis" in his 1845 publication to depict the way toward collecting a chemical compound from different substances. The following milestone in the development of organic synthesis was the planning of the principal manufactured color mauveine³ (aniline purple) by Perkin in 1856 during his endeavor to orchestrate an antimalarial sedate quinine. Afterward, the mechanical synthesis of some normal colors like alizarin⁴ by Graebe and Liebermann in 1868 and indigo⁵ by Adolf Baeyer in 1870 have been accomplished. Next, Fischer found the (+)- glucose⁶ which was a

standout amongst the most tremendous complete organic synthesis of nineteenth century. He likewise clarified the stereo chemical components of glucose and got the subsequent Nobel Prize for chemistry in 1902. In 1928, Fleming found the antibacterial medication penicillin and resulting disengagement and recognizable pieces of proof of its establishes were cultivated by Florey and Chain in 1940.

In 1944, cortisone has been presented as a medication for the treatment of joint inflammation and rheumatic fever which was trailed by the development of steroid hormones as the dynamic constituents of the preventative pills. Peterson and Murray effectively incorporated regio-and enantiospecific microbial cortisone that supplanted a 31-step chemical synthesis from a bile acid (11-hydroxyprogesterone) and made ready for the ensuing business accomplishment of the steroid hormones.

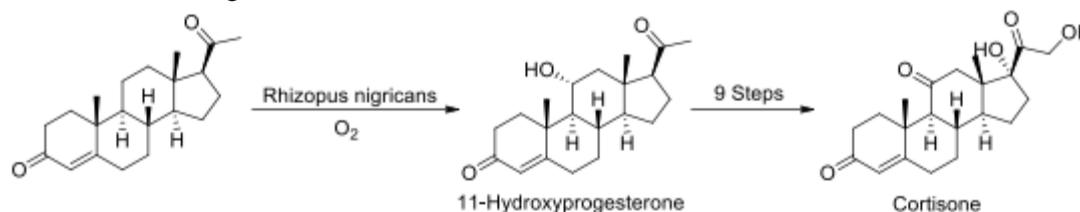


Fig. Cortisone synthesis

At present, the action is progressively associated with energy related sciences, for example, energy catch and capacity. Because of environmental problems emerging by undesirable outcomes of organic chemicals recently acquainted with the environment, the development of environment-accommodating (sustainable) forms has turned into a fascinating and testing field of organic chemistry. Key subtopics by and by canvassed in Organic Chemistry incorporates catalysis, organometallic chemistry, chemistry of

polyenes, chemo-regio-and enantioselective unions, heterocyclic chemistry, fluoro-containing mixes and NMR. As of late, research in the field of manufactured organic chemistry is centered around response plan and system development in the fields of restorative innovation, molecular nanotechnology and energy related sciences.

THE DEVELOPMENT OF ORGANIC SYNTHESIS



The well - being of present day society is unbelievable without the horde products of mechanical organic synthesis. Our personal satisfaction is firmly subject to, entomb alia, the products of the pharmaceutical business, for example, anti-infection agents for battling ailment and analgesics or against - incendiary drugs for easing torment. The birthplaces of this industry go back to 1935, when Domagk found the antibacterial properties of the red color, prontosil, the model of a scope of sulfa drugs that rapidly found their way into medicinal practice. The history of organic synthesis is by and large followed back to Wohler ' s synthesis of the common product urea from ammonium isocyanate in 1828. This let go the visvitalis (crucial power) hypothesis, which kept up that a substance created by a living life form couldn't be delivered artificially. The revelation had stupendous significance, since it demonstrated that, on a fundamental level, every single organic compound is amiable to synthesis in the research center.

The following milestone in the development of organic synthesis was the arrangement of the first engineered color, mauveine (aniline purple) by Perkin in 1856, for the most part viewed as the first mechanical organic synthesis. It is likewise an amazing case of good fortune. Perkin was attempting to blend the counter - malarial medication quinine by oxidation of N - allyltoluidine with potassium dichromate. This honorable however naïve endeavor, remembering that lone the molecular recipe of quinine ($C_{20}H_{24}N_2O_2$) was known at the time, was destined to come up short. In ensuing investigations with aniline, serendipitously defiled with toluidines, Perkin acquired a low yield of a purple - shaded product. Evidently, the youthful Perkin was a decent physicist as well as a decent specialist, and he immediately perceived the business capability of his finding. The fast

development of the product, and the procedure to make it, finished in the commercialization of mauveine, which supplanted the common color, Tyrian purple. At the season of Perkin ' s disclosure Tyrian purple, which was removed from a types of Mediterranean snail, cost more per kg than gold.

This fortunate disclosure denoted the appearance of the engineered dyestuffs industry dependent on coal tar, a waste product from steel make. The development of mauveine was trailed by the mechanical synthesis of the regular colors alizarin and indigo by Graebe and Liebermann in 1868 and Adolf Baeyer in 1870, separately. The commercialization of these colors denoted the downfall of their farming production and the introduction of a science - based, dominatingly German, chemical industry. By the turn of the twentieth century the germ hypothesis of ailment had been created by Pasteur and Koch, and for physicists looking for new uses for coal tar subordinates who were inadmissible as colors, the prospering field of pharmaceuticals was a conspicuous one for misuse. A main light in this field was Paul Ehrlich, who instituted the term chemotherapy.

He conceived that specific chemicals could go about as ' enchantment slugs ' by being incredibly lethal to a tainting organism however innocuous to the host. This drove him to test colors as chemotherapeutic agents and to the disclosure of a compelling treatment for syphilis. Since Ehrlich had contemplated color molecules as ' enchantment shots ' it wound up routine to test all colors as chemotherapeutic agents, and this training prompted the abovementioned - referenced disclosure of prontosil as an antibacterial operator. Hence, the advanced pharmaceutical industry was conceived as a turn - off of the assembling of engineered dyestuffs from coal tar. The presentation of the sulfa drugs was trailed by



the development of the penicillin anti-toxins. Fleming 's chance perception of the counter - bacterial activity of the penicillin shape in 1928 and the consequent confinement and identification of its dynamic constituent by Florey and Chain in 1940 denoted the start of the anti-infection agents period that still proceeds with today.

At generally a similar time, the steroid hormones found their way into restorative practice. Cortisone was presented by the pharmaceutical business in 1944 as a medication for the treatment of joint pain and rheumatic fever. This was trailed by the development of steroid hormones as the dynamic constituents of the prophylactic pill. The penicillins, the related cephalosporins, and the steroid hormones spoke to impressively more confounded engineered focuses than the before referenced sulfa drugs. For sure, as the objective molecules moved from promptly accessible common mixes and generally straightforward engineered molecules to complex semi - manufactured structures, a key factor in their fruitful presentation into medicinal practice turned into the accessibility of an expense - compelling synthesis. For instance, the disclosure of the regio and enantiospecific microbial hydroxylation of progesterone to 11 α - hydroxyl progesterone by Peterson and Murray at the Upjohn Company prompted an industrially practical synthesis of cortisone that supplanted a 31 - step chemical synthesis from a bile acid and made ready for the ensuing business accomplishment of the steroid hormones. As indicated by Peterson, when he proposed the microbial hydroxylation, numerous exceptional organic scientific experts were of the feeling that it couldn't be finished. Peterson's reaction was that the microbes didn't ' t realize that. Despite the fact that this chemistry was designed four decades before the term Green Chemistry was formally

instituted, it stays one of the remarkable uses of Green Chemistry inside the pharmaceutical business.

CONCLUSION

In outline, created protocol utilizes a novel and green impetus which is effectively accessible, reasonable and completely innocuous to human and condition. It permits quick and general synthesis of blocked off 2- arylideneindane-1,3-diones offering extremely alluring highlights, for example, decreased response time, no energy utilization, great waste administration with effectively biodegradable impetus, no organic solvents, simple stir up methodology, reusable, non-toxic and safer response medium alongside significant returns.

Green chemistry has developed from a little thought into another way to deal with the deductively based ecological insurance. By utilizing green chemistry standards we can change or adjust the regular methods which are not eco-friendly. Scientists and pharmaceutical companies should be urged to think about the standards of green chemistry while structuring and picking reagents.

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