Advanced Studies in Pure Science and Applied Science

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Current Research in Green Chemistry to Sustain the Life

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Abstract:

In day to day life the population of earth increase, with increase in many problems to sustain the life. These problems are solved with the help of science filed. Health problems, need of food, shelter these basic need are completed by human beings but environmental issues are arises and these are solved with the help of green chemistry. Green chemistry can help to limit the creation of harmful compounds during chemical manufacturing. Green chemistry can help to solve health and environmental issues. Green chemistry reduces pollution in chemical laboratories. It is advantageous to reduce chemical waste and boost reaction product output. When dangerous compounds are produced during the manufacturing of medications in companies, the primary priority is the safety and health of those working in laboratories.

Keywords: *Catalysis waste, Principal of green chemistry, Biodegradation, Safer Chemicals.*

Introduction:

Green chemistry and chemical engineering aid in the reduction of waste and the production of hazardous products. That field's goal is to rethink processes and chemical products in order to decrease chemical waste and environmental consequences. It highlights academic and industrial efforts to solve the difficulties of chemical industry sustainability, and it shows that progress is being achieved in both academia and industry. In a phrase, green chemistry is the use of a set of principles in the design, production, and application of chemical products to decrease or eliminate the use or creation of hazardous compounds [1]. Green chemistry, as the name implies, is environmentally benign and even eliminates the formation of toxic bi-products during product synthesis and manufacturing [2]. Green chemistry focuses on reducing dangerous chemical compounds to the environment in the laboratory.

Sustainable development: Green chemistry plays a vital role in long-term growth. Sustainable development is defined as development that satisfies current demands without jeopardising future generations' capacity to meet their own. Sustainable development has progressed as a means of safeguarding the world's resources. The twelve-principle was presented by Paul T. Anastos and John Warner in 1991 by the Environmental Protection Agency (EPA). [3]

PRINCIPLES OF GREEN CHEMISTRY:

1. Waste prevention It is preferable to prevent waste than treat or clean up waste after it has occurred. ZWT (zero waste technology) must be created.

2. Atom economy: Minimize waste at the molecular level and turn raw materials into finished goods. Reduce the risk of harm by using fewer chemicals. Synthetic procedures should be devised to include all components utilised in the process as much as possible into the final result. A good atom economy implies that the majority of the reactant atoms are absorbed into the intended products, with just little quantities of undesirable by-products generated.

$$\% \text{ atom economy} = \frac{\text{Formula weight of the desired product}}{\text{sum of formula weight of all the reactants used in the reaction}} \times 100$$

3. Chemical synthesis that is less hazardous:

Excessive use of drugs and chemicals is bad for health. Toxicity is reduced, which is good for human health and the environment. We can prevent hazardous waste from forming as a result of chemical procedures:

4. Creating safe and secure chemicals:

Using less harmful raw materials to build a secure and non-toxic medicinal product. For avoid toxic substance mishaps at the industrial level.

5. Safety solvents and supplements:

Use the safest solvent available for the reaction to reduce the overall amount of solvents and auxiliaries used, as well as the amount of waste material produced.

6. Design for energy consumption:

The environmental and economic consequences of chemical processes should be evaluated, and energy requirements should be reduced. Synthetic techniques should be carried out at room temperature and pressure if at all possible.

7. Optimize for decomposition:

The chemical product should be designed in such a way that it does not harm the environment. Chemical goods should be intended to degrade into harmless degradation products and not stay in the environment once they have done their job.

8. Eliminate derivative products:

Unnecessary blocking group usage, protection/deprotection, and temporary alteration of physical/chemical processes should be reduced or avoided if at all feasible, as these actions need additional reagents and produce waste. Green chemistry aids in reducing waste by-products and undesired stages in chemical reactions.

9. Use renewable biofuel:

Instead of using other chemicals, use chemicals that are generated from renewable (plant-based) sources (for example: Crude Oil). Raw materials are sustainable and cost-effective.

10. Catalysis:

Using a catalyst during a chemical process can help us shorten reaction time, boost product yield, and reduce waste and reaction time.

11. Pollution prevention by critical analysis:

Analytical procedures must be improved to enable for real-time, in-process control and monitoring prior to the creation of hazardous compounds.

12. Chemicals that is way safer for injury prevention:

Substances and the form of a material used in a chemical reaction should be selected to reduce the risk of chemical accidents, such as releases, explosions, and burning. [4]

Green Chemistry's Advantages

Green Chemistry reduces garbage production. Green chemistry, in reality, is a novel method to preserving human health and the environment. Energy conservation and consumption have long been recognised as having a significant environmental impact. In contrast to chemical transformations that have traditionally been carried out in liquid solutions, microwave irradiation in the solid state is a technology that is being used to cause chemical transformations quickly.

SYNTHESIS IN THE MICROWAVE:

To the chemical process, microwave radiations will be produced. Microwave support that has been synthesised improves the purity and yield of the product. Reaction time is faster.

Microwaves heat any substance containing mobile electric charges by acting as high frequency electric fields. The polar solvent is heated, forcing the chemical molecules to spin with the field and losing energy in the process. Novel potential for synthetic chemists in drug development of new reactions those aren't possible to achieve using traditional methods. [5,6, & 7] Solvent-free microwave aided reactions enable the use of open vessels, reducing the risk of high pressure and boosting the possibilities for scale-up.

APPLICATION:

- Microwave reactions are helpful in the development of novel drugs at the industrial level as well as in research.
- Microwave speeds up the response rate compared to the traditional approach.
- High and pure yield: The reaction product was recovered in high yield notwithstanding the side product observation.
- Microwave radiation immediately heats the solvent, which causes the reaction to proceed in less time and with less energy.
- The amount of energy used is reduced.
- Microwaves are important in polymer, nanotechnologies, and inorganic synthesis because they can readily monitor temperature and chemical reactions.
- They are also environmentally beneficial since they purify the result and utilise less harmful reagents.

SONICATOR:

- Sound waves are used to agitate particles in a solution, which may then be utilised to mix solutions.
- The rate at which a solid dissolves into a liquid. In the same way as sugar dissolves in water.
- Ultrasound waves are created by converting high-frequency electrical energy.
- Ultrasonic transducers attached to a stainless steel water tank. These frequency vibrations produce liquid bubbles that expand and colloid on occasion.
- Dissolve the gas from the liquids. The material must be cleaned.
- The transformation of a solid into a liquid.
- A frequency of ultrasound that is larger than 20Hz. Ultrasound irradiation, often known as Sonochemistry,' is a crucial aspect of organic chemistry.

- Ultrasonic energies have recently been incorporated in organic synthesis processes, both homogeneously and heterogeneously. [1,8]

Conclusion:

Green chemistry contributes to long-term sustainability through green synthesis, energy-efficient manufacturing processes, and recyclable and reusable materials. One of the most significant disciplines in the future will be green chemistry. Despite the fact that this discipline has advanced fast in the previous 20 years, it is still in its infancy. Promoting green chemistry is a long-term undertaking that requires the resolution of several difficult scientific and technological difficulties in the fields of chemistry, material science, engineering, environmental science, physics, and biology. Scientists, engineers, and businesspeople should collaborate. Green chemistry contributes to the preservation of ozone in the stratosphere, which is necessary for the existence of life on Earth. Green chemistry is beneficial in reducing the greenhouse effect (Global warming). As a result, we must consider how to conserve the ecology and the world.

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