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Relevance of Environment And Green Chemistry

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Abstract: ***Green chemistry is also known as environmentally benign chemistry or sustainable chemistry. Paul Anastas and John Warner, who defined green chemistry as the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances. Chemical developments also bring new environmental problems and harmful unexpected side effects, which result in the need for 'greener' chemical products. Green chemistry looks at pollution prevention on the molecular scale and is an extremely important area of Chemistry due to the importance of Chemistry in our world today and the implications it can show on our environment. The Green Chemistry program supports the invention of more environmentally friendly chemical processes which reduce or even eliminate the generation of hazardous substances.***

Green chemistry is about waste minimization of source, use of catalyst in place of reagents, using Non-toxic Reagents, use of renewable resources, improved atom efficiency, use of solvent free or recyclable environmentally benign solvent systems.

Goals of Green Chemistry are to develop products that degrade more rapidly in the environment than the current products, to reduce the requirements for hazardous persistent solvents and extractants in chemical processes, to improve energy efficiency by developing low temperature and low pressure processes using new catalysts, also to develop efficient & reliable methods to monitor the processes for better and improved controls.

Key words : *Sustainable,* hazardous, Pollution prevention, catalyst, efficient, environment, solvent.

Introduction- Sustainable and green chemistry in very simple terms is just a different way of thinking about how Chemistry and chemical engineering can be done. Over the years different principles have been proposed that can be used when thinking about the design, development and implementation of chemical products and processes. These products enable scientists and engineers to protect and benefit the economy, people and the planet by finding creative and innovative ways to reduce waste, conserve energy and discover replacements for hazardous substances.

Green chemistry applies across the life cycle of a chemical product, including its design, manufacture, use, and ultimate disposal. While environmental chemistry focuses on the effects of polluting chemicals on nature, green chemistry focuses on the environmental impact of chemistry, including lowering consumption of nonrenewable resources and technological approaches for preventing pollution.

Green chemistry-

- Prevents pollution at the molecular level
- Is a philosophy that applies to all areas of chemistry, not a single discipline of chemistry
- Applies innovative scientific solutions to real-world environmental problems
- Results in source reduction because it prevents the generation of pollution
- Reduces the negative impacts of chemical products and processes on human health and the environment
- Lessens and sometimes eliminates hazards from existing products and processes
- Designs chemical products and processes to reduce their intrinsic hazards.

How Green Chemistry Prevents Pollution- Green chemistry reduces pollution at its source by minimizing or eliminating the hazards of chemical feedstocks, reagents, solvents, and products. This is not the same as cleaning up pollution (also called remediation), which involves treating waste streams (end-of-the-pipe treatment) or cleanup of environmental spills and other releases. Remediation may include separating hazardous chemicals from other materials, then treating them so they are no longer hazardous or concentrating them for safe disposal. Most remediation activities do not involve green chemistry. Remediation removes hazardous materials from the environment; on the other hand, green chemistry keeps the hazardous materials from being generated in the first place.

If a technology reduces or eliminates the hazardous chemicals used to clean up environmental contaminants, this technology would also qualify as a green chemistry technology. One example is replacing a hazardous sorbent [chemical] used to capture mercury from the air for safe disposal with an effective, but

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nonhazardous sorbent. Using the nonhazardous sorbent means that the hazardous sorbent is never manufactured and so the remediation technology meets the definition of green chemistry.

The 12 Principles of Green Chemistry-

1. **Prevent waste:** Design chemical syntheses to prevent waste. Leave no waste to treat or clean up.
2. Maximize atom economy: Design syntheses so that the final product contains the maximum proportion of the starting materials. Waste few or no atoms.
3. **Design less hazardous chemical syntheses:** Design syntheses to use and generate substances with little or no toxicity to either humans or the environment.
4. **Design safer chemicals and products:** Design chemical products that are fully effective yet have little or no toxicity.
5. **Use safer solvents and reaction conditions:** Avoid using solvents, separation agents, or other auxiliary chemicals. If you must use these chemicals, use safer ones.
6. **Increase energy efficiency:** Run chemical reactions at room temperature and pressure whenever possible.
7. **Use renewable feedstocks:** Use starting materials (also known as feedstocks) that are renewable rather than deplorable. The source of renewable feedstocks is often agricultural products or the wastes of other processes; deplorable feedstocks are often fossil fuels (petroleum, natural gas, or coal) or mining operations.
8. **Avoid chemical derivatives:** Avoid using blocking or protecting groups or any temporary modifications if possible. Derivatives use additional reagents and generate waste.
9. **Use catalysts, not stoichiometric reagents:** Minimize waste by using catalytic reactions. Catalysts are effective in small amounts and can carry out a single reaction many times. They are preferable to stoichiometric reagents, which are used in excess and carry out a reaction only once.
10. **Design chemicals and products to degrade after use:** Design chemical products to break down to innocuous substances after use so that they do not accumulate in the environment.
11. **Analyze in real time to prevent pollution:** Include in-process, real-time monitoring and control during syntheses to minimize or eliminate the formation of byproducts.
12. **Minimize the potential for accidents:** Design chemicals and their physical forms (solid, liquid, or gas) to minimize the potential for chemical accidents including explosions, fires, and releases to the environment.

Benefits of Green Chemistry Human Health-

- **Cleaner air and water :** Less release of hazardous chemicals to atmosphere leading to less damage to environment.
- Increased safety for workers in the chemical industry; less use of toxic materials; less personal protective equipment required; less potential for accidents (e.g., fires or explosions).
- Safer consumer products of all types: new, safer products will become available for purchase; some products (e.g., drugs) will be made with less waste; some products (i.e., pesticides, cleaning products) will be replacements for less safe products.
- **Safer food:** elimination of persistent toxic chemicals that can enter the food chain; safer pesticides that are toxic only to specific pests and degrade rapidly after use.
- Less exposure to such toxic chemicals as endocrine disruptors.

Environment-

- Many chemicals end up in the environment by intentional release during use (e.g., pesticides), by unintended releases (including emissions during manufacturing), or by disposal. Green chemicals either degrade to innocuous products or are recovered for further use.
- Plants and animals suffer less harm from toxic chemicals in the environment.
- Lower potential for global warming, ozone depletion, and smog formation.
- Less chemical disruption of ecosystems.
- Less use of landfills, especially hazardous waste landfills.

Economy and Business-

- Higher yields for chemical reactions, consuming smaller amounts of feedstock to obtain the same amount of product.
- Fewer synthetic steps, often allowing faster manufacturing of products, increasing plant capacity, and saving energy and water.

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- Reduced waste, eliminating costly remediation, hazardous waste disposal, and end-of-the-pipe treatments.
- Better performance so that less product is needed to achieve the same function.
- Reduced use of petroleum products, slowing their depletion and avoiding their hazards and price fluctuations.
- Reduced manufacturing plant size or footprint through increased throughput.
- Increased consumer sales by earning and displaying a safer-product label (e.g., Safer Choice labelling).
- Improved competitiveness of chemical manufacturers and their customers.

Conclusion- Green chemistry is about waste minimization of source, use of catalyst in place of reagents, using Non-toxic Reagents , use of renewable resources, improved atom efficiency, use of solvent free or recyclable environmentally benign solvent systems.

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REFERENCES

1. https://www.slideshare.net>Green Chemistry.
2. https://www.epa.gov>Basics of Green Chemistry.
3. https://www.acs.org>green chemistry
4. https.en.m.wikipedia.org> Green Chemistry
5. https://www.rsc.org>Green Chemistry Journal
6. https://byjus.com>Green Chemistry
7. https://Chemicals.gov.in> Green chemistry

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