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Prevantion Of Pollution Through green Chemistry

Leena Lakhani
Govt.Girls P.G.College, Ujjain, M.P. India
Email: leenalakhani56@gmail.com

Abstract
The use of chemicals in our environment is increasing day by day. Only some of them can be degraded but most of them are persisted in environmentand they are non-degradable.These non-degradable components create pollution and cause imbalance in different types of ecosystems. Pollution is creating a risk to the environment. Thus in order to reduce the risk of pollution, a system should be introduced that must reduce the risk by not changing the effects but by changing the causes also. Thus a new concept named Green Chemistry was introduced.In Green Chemistry new design of chemicals and applied processes are introduced that reduce or eliminate the use and generation of hazardous substance. Itis highly effective approach to pollution prevention because it applies innovative scientific solutions to real world environmental situations.

Keywords: *Green Chemistry, Degradable, Non-Degradable, Ecosystem, Environment, Pollution prevention, Hazardous substance.*

Introduction

Green chemistry can be defined as the invention, design and application of chemical products and processes to reduce or to eliminate the use and generation of hazardous chemicals for workers and consumer. The definition of Green Chemistry starts with the concept of invention and design. This means we must take into account from the start what we are looking for, what kind of product, how we are going to design its manufacture and its use. The impact of chemical products and chemical processes must be included as design criteria. Hazard considerations for initial materials and final products must also be included in the performance criteria

Green chemistry goes to the root of the problem and aims to eliminate the hazard itself. Green Chemistry is the onlyscience that focuses on the intrinsic hazard of a chemical or chemical process. It seeks to minimize or eliminate that hazard so that we do not have to worry about exposure. The Environmental Science and Green Chemistry, both areas of study seek to make the world a better place;both are complimentary to each other. Environmental Science identifies sources, elucidates mechanisms and quantifies problems in the earth's environment. Green Chemistry seeks to solve these problems by creating alternative, safe technologies. Green Chemistry is not Environmental Chemistry. Green Chemistry targets pollution prevention at the source, during the design stage of a chemical product or process, and thus prevents pollution before it begins.

From the beginning of the 1990s, the ideas of Green Chemistry started to have a more international outlook. The purpose was to initiate alternative practices in the chemical industry and processes more benign to the environment. A committee of scientists and technological experts was convened from many industrial countries (Japan, USA, Germany, Sweden, Canada, etc.) to propose the basic areas of research and development for Green Chemistry

applications. They were selected with emphasis on economic considerations and for their future contribution to sustainable development.

Green Chemistry and Sustainable Development

In the 20th century, chemistry changed our lives. It has shaped our modern technological society by supplying us with energy, medicines, crop protection, foodstuffs, and new materials worldwide. Unfortunately, even though chemistry is the science with the highest impact on our everyday lives, chemicals and the chemical industry have a poor public image. This is partly due to misconceptions and media scares, but there is also a valid reason: the traditional chemical industry, certainly until the 1980s, was a hazardous and polluting one. It generated stoichiometric amounts of waste, causing much pollution of both air and water. A number of major chemical accidents have reinforced this image in recent decades .The most infamous are the Bhopal catastrophe in 1984, where 3000 people were killed and more than 40 000 injured [1], and the grounding of the Exxon Valdez in the Prince William Sound in Alaska in 1989, that still affects the marine ecosystem nearly 20 years later .Apart from the immediate health and environmental hazards, there is also the problem of resource management. The chemical industry during the past 200 years drew heavily on resources. Today, the escalating costs of petrochemicals, and the increasing energy and raw material demands in Asia's emerging markets, are forcing a change. Two popular terms associated with this change are sustainability, or sustainable development. A sustainable society is one that meets the needs of the current generation without sacrificing the ability to meet the needs of future generations. Sustainable development is a strategic goal. It can be reached using various approaches, and this is where green chemistry comes in Figure, it shows the relationship between the strategic goals, the practical approaches, and the operational and monitoring tools. Thus, green chemistry is just one step (albeit an important one) along the road to sustainability.

Principles of Green chemistry

Twelve Principals of green chemistry, originally developed by Paul Anastars and John Warner, provide a road map for chemist to implement green chemistry. These are

1 **Prevent waste:** Design chemical syntheses to prevent waste. Leave no waste to treat or clean up.

2. **Atom Economy:** This principle states that it is best to use all the atoms in a process. And, those atoms that are not used end up as waste.

3**. Use of alternative feedstocks:** There are already many new developments in this field, but the emphasis on renewable raw materials and a shift from fossil fuels is very desirable for sustainability. The starting materials for the chemical industry must be renewable and less toxic for workers and the environment.

4**. Design less hazardous and safer chemicals and products**: Design chemical products that are fully effective yet have little or no toxicity to either humans or the environment.

5. Use safer solvents and reaction conditions: Avoid using solvents, separation agents, or other auxiliary chemicals. If use these chemicals, use safer ones.Chemists use now less toxic solvents and their waste can be recycled or decomposed at high temperatures. The chemical industry invested, under the Green 30 Chemistry principles, in new solvents which are less toxic to workers and can disintegrate more easily under environmental conditions.

6. **Increase energy efficiency**: Run chemical reactions at room temperature and pressure whenever possible.Today there is a focus on renewable energy and energy conservation. We use energy for transportation purposes and to provide electricity to our homes and businesses. Traditional methods for generating energy have been found to contribute to global environmental problems such as Global Warming and the energy used can also be a significant cost. This principle focuses on creating products and materials in a highly efficient manner and reducing the

energy associated with creating the products, therefore reducing associated pollution and cost.

7. **Use renewable feedstocks**: Use starting materials (also known as feedstocks) that are renewable rather than depletable. The source of renewable feedstocks is often agricultural products or the wastes of other processes; the source of depletable feedstocks is often fossil fuels (petroleum, natural gas, or coal) or mining operations. 90-95% of the products we use in our everyday lives are made from petroleum.Biodiesel is one example of this where researchers are trying to find alternative fuels that can be used for transportation besides petrol.Another example is alternative, bio-based plastics. PLA (polylactic acid) is one plastic that is being made from renewable feedstocks such as corn and potato waste.

8. **Avoid chemical derivatives**: Avoid using blocking or protecting groups or any temporary modifications if possible. Derivatives use additional reagents and generate waste.This principle aims to simplify that process and to look at natural systems in order to design products in a simplified manner.

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. New biosynthetic methods were developed in the last decades which are more selective, use less energy, lower temperatures, higher yields and demand raw materials which are less toxic. Green Chemistry research in the last decades replaced many old methods and introduced some innovative catalytic methods with high yields and less waste.

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. **Analyse in real time to prevent pollution**: Include in-process, real-time monitoring and control during syntheses to minimize or eliminate the formation of by-products.

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.

Green chemistry's roots in the Pollution Prevention Act of 1990

To stop creating pollution in the first place became America's official policy in 1990 with the Federal Act.

The law defines **source reduction** as any practice that:

Reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) prior to recycling, treatment, or disposal.

- Reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants.

The term "source reduction" includes:

- Modifications to equipment or technology
- Modifications to process or procedures
- Modifications, reformulation or redesign of products
- Substitution of raw materials
- Improvements in housekeeping, maintenance, training, or inventory control

Section 2 of the Pollution Prevention Act establishes a pollution prevention hierarchy, saying:

- The Congress hereby declares it to be the national policy of the United States that pollution should be prevented or reduced at the source whenever feasible;
- Pollution that cannot be prevented should be recycled in an environmentally safe manner, whenever feasible;
- Pollution that cannot be prevented or recycled should be treated in an

environmentally safe manner whenever feasible; an
- Disposal or other release into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner.

For those who are creating and using green chemistry, the hierarchy looks like this:

1. Source Reduction and Prevention of Chemical Hazards
   - Designing chemical products to be less hazardous to human health and the environment*
   - Making chemical products from feedstocks, reagents, and solvents that are less hazardous to human health and the environment*
   - Designing syntheses and other processes with reduced or even no chemical waste
   - Designing syntheses and other processes that use less energy or less water
   - Using feedstocks derived from annually renewable resources or from abundant waste
   - Designing chemical products for reuse or recycling
   - Reusing or recycling chemicals
2. Treating chemicals to render them less hazardous before disposal
3. Disposing of untreated chemicals safely and only if other options are not feasible.

Conclusion

Green chemistry deals with designing chemical products and processes that generate and use fewer (or preferably no) hazardous substances. By applying the principles of green chemistry, companies embrace cleaner and more efficient technologies, with an a priori commitment to a cleaner and healthier environment.Green chemistry applies across the life cycle of a chemical product, including its design, manufacture, use, and ultimate disposal. The green chemistry message is simple: Seek prevention, not cure.

Green chemistry, also known as sustainable chemistry, is a philosophy of chemical research and engineering that encourages the design of products and processes that minimize the use and generation of hazardous substances. In 1990 the Pollution Prevention Act was passed in the United States. This act helped create a modus operandi for dealing with pollution in an original and innovative way. It aims to avoid problems before they happen.

- 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
- seems to focus on industrial applications;
- 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 hazard from existing products and processes
- Designs chemical products and processes to reduce their intrinsic hazards.

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