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Investigating the Study of Green Chemistry and Its Achievements in Protecting the Environment and Preventing Pollution

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ABSTRACT

Chemistry is associated with concepts such as products, industry, employment, trade, development, and environmental hazards. Preserving the environment and natural resources is one of the major challenges that mankind faces on the eve of the twenty-first century, while the need to improve standards of living in developing countries has not lost its importance. The chemical, health and pharmaceutical industries have created employment for many people, so they play a key role in the social and economic life of societies. Industrial production most products are based on chemical interactions, some of which are toxic and dangerous. Undoubtedly, as much as we can avoid the use of chemicals in our lives or prevent the release of these substances in nature, we have helped ourselves and the environment. But in these preventive strategies, which have not been prominent so far, it seems that we also need to consider more effective ways to change the way chemicals are used to reduce their harm to humans and the environment is one of those ways. Today, this new approach is called Green Chemistry, which is the design of chemical products and processes that reduce or eliminate the use and production of harmful substances to human health and the environment. Green chemistry is not one of the oldest green washing methods, but is a key component of new technologies that are better off, cheap, and require less energy. In a complete period of production, from raw material to the final product, it produces less pollution. In fact, the green technology revolution is equivalent to the industrial revolution. This paper reviews the achievements of green chemistry in protecting the environment and preventing pollution.

Keyword:
Green Chemistry, Environment, Pollution Prevention, Environmental Hazards

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1. Introduction

Chemistry plays a fundamental role in the advancement of human civilization, and its place in the economy, politics, and life has become more and more colorful day by day. In this regard, the industry and mining sector is very much concerned about the fact that it can play a major role in improving living standards and, on the other hand, can have important environmental impacts. However, chemistry has always been a major contributor to human health and the environment through its progress, which has always been beneficial. It has now been proven that patterns of industrial development, in which environmental considerations are not considered, are unsustainable patterns. In fact, at the national level, it is not just the economic growth that needs to be addressed, but also the importance of this growth. Chemist's years of effort and research have attracted certain substances of nature that are highly adaptable to human health and environmental conditions, and have turned them into cases that have challenged human and environmental health. Also, these materials simply do not return to the natural cycle of materials, and for many years they remain intact and permanent in nature. On the other hand, many processes that lead to the production of chemicals or synthetic products can be harmful to the environment or human health [1]. So eliminating or reducing these risks to an acceptable level is a very important issue. We are helping ourselves and the environment as much as we can avoid using chemicals in our lives or preventing the release of such substances in nature. But along with these preventive approaches, it seems that we also need to find ways more efficient in changing the way chemicals are used to reduce their harm to humans and the environment is one of those ways. In the past decade, some chemists have taken a new look at the production of products without the use of toxic substances without the production of toxic residues and residues. Green chemistry, also called sustainable chemistry, is the research philosophy of chemistry and chemical engineering that aims to design products and processes that are environmentally compatible and minimize the risks of chemicals [2]. While environmental chemistry is natural and contributes to contaminating chemicals in nature, green chemistry seeks to reduce and prevent pollution in the environment [3]. The development of chemistry, in particular the use of its capabilities to produce more environmentally friendly materials, is one of the most effective and useful tools for development. In chemistry, a green revolution is in the process of development that not only brings environmental sustainability and benefits, but also greatly reduces the risks of industrial catastrophes. Industrial production of most products is based on chemical interactions [4]. Over the past decade, some chemists have taken a new look at the production of products without the use of toxic substances without creating hazardous waste. The goals of green chemistry include the use of renewable resources, reducing the number of process steps, increasing energy efficiency, designing healthier chemical products and materials, increasing the efficiency or efficiency of chemical processes, using low-grade raw materials. Therefore, the ultimate goal of green chemistry is to make the quality of life on a planet cleaner and safer [5]. In this article, the role and application of green chemistry to protect the environment and prevent contamination has been studied.

2. Green chemistry and its History

New processes in laboratories can prevent industrial pollutants and produce new products that are environmentally friendly. This growing technology minimizes the use of hazardous materials in design and production, thus providing a fundamentally different approach to reducing pollution [6]. The term green chemistry relates to the design of products and processes that reduce or completely eliminate the production and use of hazardous materials, and it is based on twelve foundations that are designed or redesigned by molecules, materials, and chemical transformations to make them healthier for humans and the environment. In early 1990, green chemistry gained its current reputation as a scientific system for preventing air pollution, as a result of collaboration between the US government, the artisans and the scientific community. It was the founder of US government policies to reduce or prevent pollution at source, wherever possible. It also provides a way to take steps beyond what is being done by the United States Environmental Protection Agency (EPA) and planning innovative strategies to protect human health and the environment. According to the law, the reduction of pollution in the source is fundamentally different and more favorable than waste management and pollution control. At that time, Paul Anastass, the head of the United States of America's Chemical Industry, was able to give some credit to the concept of green chemistry with his tireless efforts. In the mid 1990s, Paul Anastass and John Warner developed 12 principles of green chemistry that examined the general framework for preventing air pollution when the chemical was invented [7]. Following the adoption of this law, the Office of Pollution Prevention and Toxics (OPPT) reviewed the idea of creating or improving chemical products and processes to reduce their risks. In 1991, OPPT launched a pilot program. According to the program, for the first time, funding was provided for research projects on the prevention of contamination in the production of chemical products. Since then, the green environment of green program has established partnerships with universities, industries, other government agencies, and NGOs to prevent pollution through the implementation of green chemistry. In 1993, under the supervision of the US government, the Chemistry World was published by the Chemistry Society in June 1993, and was widely appreciated by many in Europe. In 1995, US President Bill Clinton examined the chemical technologies used in the design, structure, and use of chemicals, and ultimately considered a reward for competition in the production of green chemistry. Awards and annual appreciation by the US government of groups as well as organizations and associations have increased the speed of dissemination of green chemistry information in the industry.

3. Principles of Green Chemistry

Green chemistry, more commonly known as a molecular-level pollution prevention strategy, rests on twelve foundations that rely on designing or re-designing molecules, materials, and chemical transformations to make them healthier for humans and the environment based on

them. The twelve principles of green chemistry are as follows:

1) Prevention

It is better to prevent waste than to treat or clean up waste after it has been created.

2) Atom Economy

Synthetic methods should be designed to maximize the incorporation of all materials used in the process into the final product.

3) Less Hazardous Chemical Syntheses

Wherever practicable, synthetic methods should be designed to use and generate substances that possess little or no toxicity to human health and the environment.

4) Designing Safer Chemicals

Chemical products should be designed to affect their desired function while minimizing their toxicity.

5) Safer Solvents and Auxiliaries

The use of auxiliary substances (e.g., solvents, separation agents, etc.) should be made unnecessary wherever possible and innocuous when used.

6) Design for Energy Efficiency

Energy requirements of chemical processes should be recognized for their environmental and economic impacts and should be minimized. If possible, synthetic methods should be conducted at ambient temperature and pressure.

7) Use of Renewable Feedstocks

A raw material or feedstock should be renewable rather than depleting whenever technically and economically practicable.

8) Reduce Derivatives

Unnecessary derivatization (use of blocking groups, protection/ deprotection, temporary modification of physical/chemical processes) should be minimized or avoided if possible, because such steps require additional reagents and can generate waste.

9) Catalysis

Catalytic reagents (as selective as possible) are superior to stoichiometric reagents.

10) Design for Degradation

Chemical products should be designed so that at the end of their function they break down into innocuous degradation products and do not persist in the environment.

11) Real-time analysis for Pollution Prevention

Analytical methodologies need to be further developed to allow for real-time, in-process monitoring and control prior to the formation of hazardous substances.

12) Inherently Safer Chemistry for Accident Prevention

Substances and the form of a substance used in a chemical process should be chosen to minimize the potential for chemical accidents, including releases, explosions, and fires.

4. Benefits of Green Chemistry

Chemical plants are a lot of valuable materials. These materials include antibiotics and other drugs, plastic materials, gasoline and other fuels, chemical agricultural materials such as fertilizers and chemical toxins, nylon fabrics, silk and polyester. These products are valuable, but some of the chemical materials used to make them harm the environment and human health [8]. The goal of green chemistry is to reduce pollution by preventing it from occurring in the first place. Advanced countries and growing countries use this technology, because chemistry and green technology are cheaper and better, they can compete more in the global economy and increase their share in the market [9]. Advantages of using green chemistry include:

- Human health
- Fresh air
- Healthy water
- Less toxic and risky use
- Less personalized protection
- Safer consumer products

5. Green Chemistry and Environmental Protection

Over the years, researchers have taken raw materials from nature, which are highly adaptable to human health and environmental conditions, and have transformed them into substances that challenge human health and the environment. Also, these materials simply do not return to the natural cycle of materials, and for many years they remain in the form of highly harmful and permanent rubbish in nature. Green technology products are items that have environmental knowledge in their design and application. Green technology products, popular in the 21st century, aim at reducing waste, pollution and even the elimination of fossil fuels. Some of the main types of green tech products

include energy products, green chemicals, sustainable or renewable products, and technologies that work on alternative energies and can be effective in protecting the environment [10]. One of the main issues underlying the green technology movement's focus is the reduction of the use of fossil fuels. Products that help create alternative energy such as solar panels and heating screens are the most important products of green technology that are used in everyday life. Solar panels that can be installed in houses, apartments, and commercial buildings use the warmth of the sun to recharge solar batteries, which can be used instead of traditional gas sources such as gas. Heating panels are also used in pools and absorb the sun's rays and reach the surface of the pool and provide a substitute for heating that eliminates the use of fossil fuels. Green chemicals are important in all products of green technology. These products are designed to produce the same effects as toxic and polluting chemicals, but without the risk of poisoning and damage to the environment. Green chemicals include household cleaners made of coconut and glycerin, pesticides that use orange oil and pepper instead of toxic chemicals, and even green detergents that can reduce water contamination. Envirotech, Cleantech or Greentech means using one or more environmental sciences, green chemistry, environmental monitoring, and electronic tools to monitor, model, and protect the environment and resources with the aim of eliminating the negative effects of human intervention [11]. This phrase is also used to describe sustainable energy technologies such as photovoltaics, wind turbines, bioreactors, and so on. The term "environmental technologies" is also used to describe a class of electronic tools that can help sustainably manage resources. Sustainable and renewable energy products help to increase the life cycle of consumables. These products can include mobile phones made of water bottles, recycled electrical appliances, and even recyclable laptops. Green technology products utilize recycled and durable materials that usually advertise their presence in recycling programs. Customers looking to buy a new phone or laptop may want to buy a particular model that uses recycled materials. The use of recycled products can help reduce waste and contamination, while at the same time reducing the development of landfill sites and, consequently, pollution of air and water. Another important area of green technology is the design of tools and systems that use alternative energy. In the late 20th century, it was an important innovation in the development of a hybrid engine that works both with electricity and gasoline. Solar charging tools for phones, laptops, and portable electrical appliances are also popular with green technology products. By turning everyday products into alternative energy sources, green technology can help protect the environment.

6. Green Chemistry: Preventing Pollution at the Molecular Level

Chemistry plays a fundamental role in the advancement of human civilization, and its place in the economy, politics and life of the day has become more colorful. Still, chemistry has been damaging to human health and the environment during its progress, which has always been associated with the benefit of human beings. We have heard and heard repeatedly the damages of the chemicals to the human body and the environment. But what is the solution? It seems that in addition to preventive measures that have not yet yielded significant efficiencies, we also need to consider more efficient ways in which changes in the way chemicals are made to reduce their harm to humans and the environment is one of those ways. Sustainable development and environmental issues are the most important concerns of human societies today. Although chemistry and chemical engineering offer solutions to many aspects of the challenge, chemicals themselves are part of the problem. Green chemistry therefore seeks to produce unsafe products using bio-based resources and processes that are not harmful to humans and the environment. Re-designing chemical reactions is another useful way of preventing the harmful effects of chemicals [12]. In these revisions, they use heavier starting materials or design trends that can be achieved with lesser-step reactions. It also designs trends that require less auxiliary materials, especially chemical solvents. Sometimes it binds both biochemical and chemical reactions and creates a healthier and more efficient process. Reconstructing drug trends can, with their increased efficacy, make them healthier, and reduce their side effects to the body's biological pathways as safe as possible. [13] Here are some examples of the efforts and achievements of green chemists:

- Alternative fuels

The use of fossil fuels in cars is accompanied by the release of a mass of greenhouse gases that has led to climate change. Their false burning, too, has released poisonous substances that have challenged human health. Even if we can overcome these two great challenges, we are faced with a growing decline in fossil fuels that are not averse to it. The bottlenecks, coupled with the rising cost of these fuels, which seems to continue, have devoted many engineers and engineers to the design of hydrogen fuel vehicles. Because the origin of this fuel is water, which is the most abundant substance in nature, and the product of burning this fuel in the car itself is water itself. However, hydrogen fuels face a huge challenge. Providing hydrogen from water to the electrolysis process requires electricity to advance it, and now more electricity is generated from the burning of fossil fuels. One day, with the use of some catalysts, we can use solar energy instead of fossil fuels to advance the electrolysis process, but we still have not come up with an efficient solution for cheap hydrogen production, and it does not seem to be possible in the near future. However, some scientists hope to be able to create a bioavailable environment for hydrogen.

In another approach, which is worthy of consideration, vegetable oils are used as an alternative to alternative fuel. Cooking oils can also be used to produce this type of fuel, also known as biodiesel. Although burning this type of fuels, like other fossil fuels, is released from greenhouse gas, it is produced to a large extent when plants use it to produce sugar during the process of photosynthesis. On the other hand, vegetable oils are uplifting and do not release sulfur and other harmful pollutants from burning them.

- Green and degradable plastics

Plastics have been used in the production of any industrial product, from the automotive industry to the medical world. Only about 50 million tons of plastic are produced annually

in the United States. But these materials, as sustainable waste for microbial decomposition, have encountered complex environmental challenges. Plastics, in addition to filling garbage, have an annual volume of about a few thousand tons of marine environments. It is estimated that over a million offspring die every year due to choking caused by eating plastic as food or getting trapped in plastic waste. In recent years, legal efforts have been made to prevent the disintegration of plastics. These efforts have led plastics craftsmen to pursue plastics that have less environmental impact. Disintegrating plastics and microbial plastics have been developing and expanding since many years of efforts by researchers.

- Re-designing chemical reactions

In the process of re-designing, chemical reactions are used to initiate reactions that are healthier. In this case, biochemical trends may also be beneficial. It is made of benzene, which is carcinogenic and comes from fossil fuels. But recently, two chemists have been able to make this material one of the most abundant, healthiest and most up-to-date natural ingredients, glucose. In this way, they used bacteria that were engineered with a special genetic enzyme, and inevitably made benzene from glucose in an unwanted biochemical process. Considering the atomic economy also contributes a lot. For example, researchers have managed to increase the atomic economy from 40 percent to 77 percent in the process of producing Ibuporphine, a mixture used in many tranquilizers and this means that the more atoms that the pharmaceutical company has been paying for them, they are becoming a molecule of wholesale, and less productive products that can harm the environment.

- Bio composites

Although the researchers have only tended toward composites in the last few decades, nature has very complex, complex, and complex compositions that cannot be found in terms of hardness and weight. Everywhere we look at the nature we face a composite. For example, sea shells are made of hardened ceramic composites. Our body is a multistructure made of composites such as bone, cartilage and skin. Human has been using natural compositions for many years. The strain used to make the first composites was a composite. Wooden implements, shoes, and clothing made from animal skins are all natural ingredients. Because of these diverse and unrivaled features, scientists are trying to use these materials to harsh artificial dummy composites to reduce the adverse environmental consequences of materials.

7. Discussion and Conclusion

Green chemists are keen to replace healthier chemical trends with current trends, or to bring healthier products to the community by replacing healthier materials or reacting more safely. Some of them are trying to bring chemistry closer to a biohazard, because biochemical reactions have taken place for millions of years, for humans and for the environment; they have not given rise to worries. Many of these reactions occur under normal conditions and do not require high temperatures and pressures. Their products are easy to recycle and their products are beneficial to the creatures. The modeling of these reactions can reduce current health and environmental challenges. The redevelopment of chemical reactions and chemical processes has created numerous and new opportunities for chemists and any chemist can design any of the well-known reactions that have been used for many years in factories or university laboratories in order to hedge it and reduce costs and increase efficiency and efficiency. The use of green chemistry is generally accompanied by a reduction in expenditures, which is a reduction or elimination of the total costs of eliminating some of the chemical smells and minimizing the negative environmental impacts and impacts. These two factors make it more competitive for companies. Green chemistry makes the planet cleaner, safer and more efficient. Green chemistry is the conscience of chemistry and the forward way. Hence, the opportunities offered to chemists over the long and ancient history of this knowledge seems to have now been given to contemporary chemists to make healthier memories for the future by editing what they have given in chemistry history.

8. Suggestions

- ❖ Follow up and implementation of polymer recycling projects.
- ❖ Follow up and implementation of biodegradable polymers.
- ❖ Strengthening the attitude of being responsive to environmental issues.
- ❖ Familiarize students with issues of sustainable development and environmental protection.
- ❖ Investigation and possibility of replacing organic solvents with water in polymer products.
- ❖ Contributing to the development of environmental standards.

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