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REVIEW ARTICLE

Green Chemistry for Environmental Sustainability: The waste reduction approach

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ABSTRACT

"Green Chemistry" is the universally accepted term to describe the movement towards more environmentally acceptable chemical processes and products. It encompasses education, research, and commercial application across the entire supply chain for chemicals. Green Chemistry can be achieved by applying environmentally friendly technologies – some old and some new. Our living standard rose after the industrial revolution. It developed many products that facilitate life, to extend human life. Industrial revolution has brought increased production with it. Increased production but also as a source (raw material) made to be consumed rapidly. However, no one; neither consumers nor scientists, nor some toxic industrial companies could think that thousands tons of waste contaminate air, water and soil. Only the success of the work done was measured in the linear structure of the economy without looking at the heritages it has left. Soon, serious environmental problems and industry associations, waste affecting the ecosystem could not ignore more. Waste reduction, reuse and recycling green movement started with my community's increasing awareness of nature conservation, sustainability has spread in waves with the slogan to become one of the 20th century. For a continually growing population and restricted resources in a sustainable future in a world where the idea of the idea of development in the 21st century is one of the biggest opinions of green chemistry. It is significant to understand the principles of green chemistry and green chemistry, to leave a livable world for future generations and to apply.

Keywords: Chemical pollution, green chemistry, livable environment, sustainability

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1. Introduction

The developing countries that are rapidly constructing new chemical manufacturing facilities have an excellent opportunity to apply the catchphrase of Green Chemistry "Benign by Design" from the ground upwards. It is much easier to build a new, environmentally compatible plant from scratch than to have to deconstruct before reconstructing, as is the case in the developed world. These can all be considered to be "costs of waste" that effectively penalize current industries and society as a whole. After a description of Green Chemistry I will look at the techniques available to the chemical manufacturers.[1,2] This leads naturally into a more detailed discussion about methods of evaluating "greenness" and how we should apply sustainability concepts across the supply chain. It is important that, while reading this, we see. Green Chemistry in the bigger picture of sustainable development as we seek to somehow satisfy society's needs without compromising the survival of future generations. The term Green Chemistry, coined by staff at the US EPA in the 1990s, helped to bring focus to an increasing interest in developing more environmentally friendly chemical processes and products. There were good examples of Green Chemistry research in Europe in the 1980s, notably in the design of new catalytic systems to replace hazardous and wasteful processes of long standing for generally important synthetic transformations, including Friedel–Crafts reactions, oxidations, and various base-catalyzed carbon–carbon bond-forming reactions. Some of this research had led to new commercial processes as early as the beginning of the 1990s.[3] In recent years Green Chemistry has become widely accepted as a concept meant.

To influence education, research, and industrial practice. It is important to realize that it is not a subject area in the way that organic chemistry is. Rather, Green Chemistry is meant to influence the way that we practice chemistry – be it in teaching children, researching a route to an interesting molecule, carrying out an analytical procedure, manufacturing a chemical or chemical formulation, or designing a product.[4] Green Chemistry has been promoted worldwide by an increasing but still small number of dedicated individuals and through the activities of some key organizations. These include the Green Chemistry Network (GCN; established in the UK in 1998 and now with about one thousand members worldwide) and the Green Chemistry Institute (established in the USA in the mid 1990s, now part of the American Chemical Society and with "chapters" in several countries around the world).[5-7] Other Green Chemistry Networks or other focal points for national or regional activities exist in other countries including Italy, Japan, Greece and Portugal and new ones appear every year. Green Chemistry can be considered as a series of reductions (Fig. 1). These reductions lead to the goal of triple bottom-line benefits of economic, environmental, and social improvements.[8,9] Costs are saved by reducing waste (which is becoming increasingly expensive to dispose of, especially when hazardous) and energy use (likely to represent a larger proportion of process costs in the future) as well as making processes more efficient by reducing materials consumption. These reductions also lead to environmental benefit in terms of both feedstock consumption and end-of-life disposal. Furthermore, an increasing use of renewable resources will render the manufacturing industry more sustainable. The reduction in hazardous incidents and the handling of dangerous substances provides additional social benefit – not only to plant operators but also to local communities and through to the users of chemical-related products.[10-12]

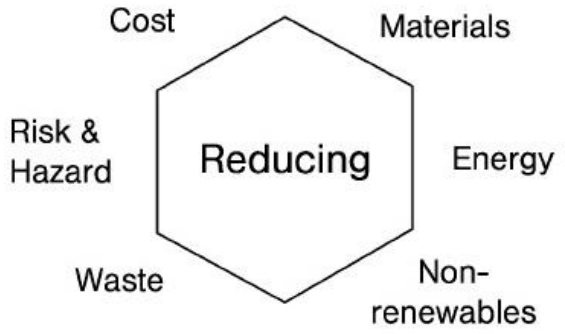

Figure 1: Reducing Policy-The heart of Green Chemistry

2. The Costs of Waste

Hundreds of tonnes of hazardous waste are released to the air, water, and land by industry every hour of every day. The chemical industry is the biggest source of such waste. Ten years ago less than 1% of commercial substances in use were classified as hazardous, but it is now clear that a much higher proportion of chemicals present a danger to human health or to the environment. The relatively small number of chemicals formally identified as being hazardous was due to very limited testing regulations, which effectively allowed a large number of chemicals to be used in everyday products without much knowledge of their toxicity and environmental impact. New legislation will dramatically change that situation. In Europe, REACH (Registration, Evaluation, Assessment of Chemicals) will come into force in the first decade of the twenty-first century and whilst, at the time of writing, the final form of the legislation has yet to be decided, it is clear that it will be the most important chemicals-related legislation in living memory and that it will have a dramatic effect on chemical manufacturing and use.[13]

REACH will considerably extend the number of chemicals covered by regulations, notably those that have been on market since 1981 (previously exempt), will place the responsibility for chemicals testing with industry, and will require testing whether the chemical is manufactured in Europe or imported for use there. Apart from the direct costs to industry of testing, REACH is likely to result in some chemical substances becoming restricted, prohibitively expensive, or unavailable.[14] This will have dramatic effects on the supply chain for many consumer goods that rely on multiple chemical inputs. Increased knowledge about chemicals, and the classification of an increasing number of chemical substances as being in some way "hazardous", will have health and safety implications,

again making the use of those substances more costly and difficult.[15] Furthermore, it will undoubtedly cause local authorities and governments to restrict and increase the costs of disposal of waste containing those substances (or indeed waste simply coming from processes involving such substances). Thus, legislation will increasingly force industry and the users of chemicals to change – both through substitution of hazardous substances in their processes or products and through the reduction in the volume and hazards of their waste.[16]

Figure 2: The costs of waste.

The costs of waste to a chemical manufacturing company are high and diverse (Fig. 2) and, for the foreseeable future, they will get worse. These costs and other pressures are now evident throughout the supply chain for a chemical product – from the increasing costs of raw materials, as petroleum becomes more scarce and carbon taxes penalize their use, to a growing awareness amongst end-users of the risks.

The clean technology Pool: There is a pool of technologies that are becoming the most widely studied or used in seeking to achieve the goals of Green Chemistry. The major "clean technologies" are summarized in Fig. 3.

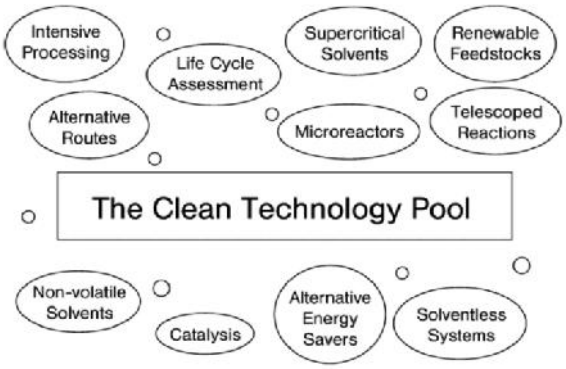

Figure 3: The major clean technologies

3. Benefits of Green Chemistry

Green Chemistry provides less waste formation addition to offering appropriate solutions in the field of economy and energy; they also reduce the risk of accidents because the front legs of the advancing reaction to the presence of a safe way. Overall this is a new approach to ensure preservation of human health and the environment; the world will play an active role in the prevention of environmental pollution in our country and is actively used in various applications. We see that there are many benefits of green chemistry.17,18 The major "benefits of green chemistry" are summarized in Fig. 4.

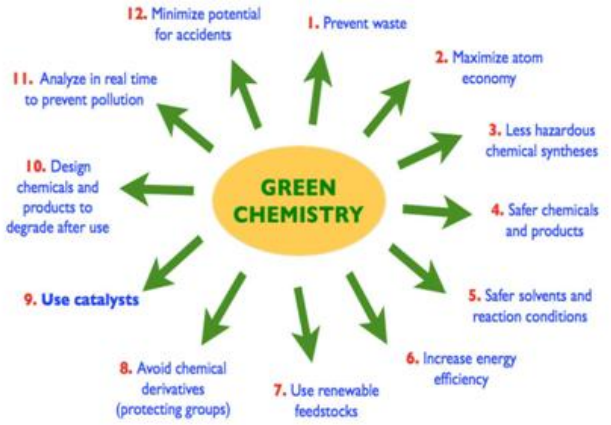

Figure 4: Benefits of green chemistry.

These advantages, human health, environment and economy may be described as subtitles, respectively.

4. Conclusion

Green chemistry aims to develop new practice of chemistry with rules which provides resolutions to problems that human is facing today such as climate changes, sustainable farming, energy need, toxics, consuming of natural sources e.g. designing new chemicals and processes that production and use of dangerous matters. Therefore green chemistry is an indispensable tool for sustainable development. It provides less waste formation addition to offering appropriate solutions in the field of economy and energy; they also reduce the risk of accidents because the front legs of the advancing reaction to the presence of a safe way. Overall this is a new approach to ensure preservation of human health and the environment; the world will play an active role in the prevention of pollution in our country and is actively used in various applications.

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