Dr. BRR. GOVERNMENT COLLEGE, JADCHERLA, MAHABUBNAGAR (Dist.)

Student Study Project

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DEPARTMENT OF CHEMISTRY

Topic

Implementation of Green chemist Principles into Practice

Conducted by students

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IMPLEMENTATION OF GREEN CHEMISTRY PRINCIPLES INTO PRACTICE.

Abstract:

Chemistry is really very helpful to us as its applications are used worldwide for several purposes. We cannot really imagine a world without chemistry and its applications such as medicines. However, we should now concentrate on green chemistry, or sustainable chemistry, which refers to reducing or stopping the damage done to the environment around us. Hence, green chemistry could include anything from reducing waste to even disposing of waste in the correct manner. Another way to save the environment through sustainable chemistry is to make use of renewable food stocks. Yet another good move is to make use of catalysts in experiments rather than using stoichiometric reagents. Chemical derivatives must be avoided as far as possible in any type of application as they often prove to be harmful. All chemical wastes should be disposed off in the best possible manner without causing any damage to the environment and living beings. This project presents selected examples of the implementation of green chemistry principles in everyday life in industry. A brief history of green chemistry is also mentioned.

1. INTRODUCTION:

Statement of the problem:

The term green chemistry[1] was first used in 1991 by Prof. Paul T. Anastas to implement sustainable development in chemistry and chemical technology by industry, academia and government. In 1995 the annual US Presidential Green Chemistry Challenge was announced. In 1996 the Working Party on Green Chemistry was created, acting within the framework of International Union of Applied and Pure Chemistry. One year later, the Green Chemistry Institute (GCI) was formed with chapters in 20 countries to facilitate contact between governmental agencies and industrial corporations with universities and research institutes to design and implement new technologies. The first conference highlighting green chemistry was held in Washington in 1997. Since that time other similar scientific conferences have soon held on a regular basis. The first books and journals on the subject of green chemistry were introduced in the 1990s, including the Journal of Clean Processes and Green Chemistry, sponsored by the Royal Society of Chemistry. Green chemistry[2-7] embodies two main components. First, it addresses the problem of efficient utilization of raw materials and the concomitant elimination of waste. Second, it deals with the health, safety and environmental issues associated with the manufacture, use and disposal or reuse of chemicals.

AIMS AND OBJECTIVES:

Green chemistry aims to design and produce cost competitive chemical products and processes that attain the highest level of the pollution-prevention by reducing pollution at its source chemicals that are less hazardous to human health and the environment are less toxic to organisms.

2. Review of Literature:

A quick review of green chemistry issues in the past decades demonstrates many methodologies that protect human health and the environment in an economically beneficial manner. The key target of green sustainable chemistry is making available to mankind useful compounds and materials while causing no harm to the environment .This approach has acquired

a central role in present days chemistry although the first embryo has long been present in literature. A century ago, when chemical industry was just beginning its development on a large scale, a particularly clear-sighted scientist ,G.Ciamician observed that it was now possible to synthesize products identical to the natural ones. However, this was done in the laboratory by using harsh conditions and excess energy. The actual advancement, he meant, would be obtained when men would learn to run chemical reactions in the mild way nature does and would develop an environment friendly chemistry.

Such concepts were much in advance of their time and embodied most of the "12 principles" of green chemistry as formulated by Anasthas and Warner at the end of the 20 th Century

.Nowadays the increasing concern for a sustainable development and increasing concern for a sustainable development and the perception of chemical industry as one of the most harmful human activity have created the conditions for the birth of green chemistry.

3. Research Methodology:

Green chemistry is commonly presented as a set of twelve principles proposed by Anastas and Warner.The principles comprise instructions forprofessional chemists to implement new syntheses and new technological process.

These principles are:

1. Prevention
2. Atom economy

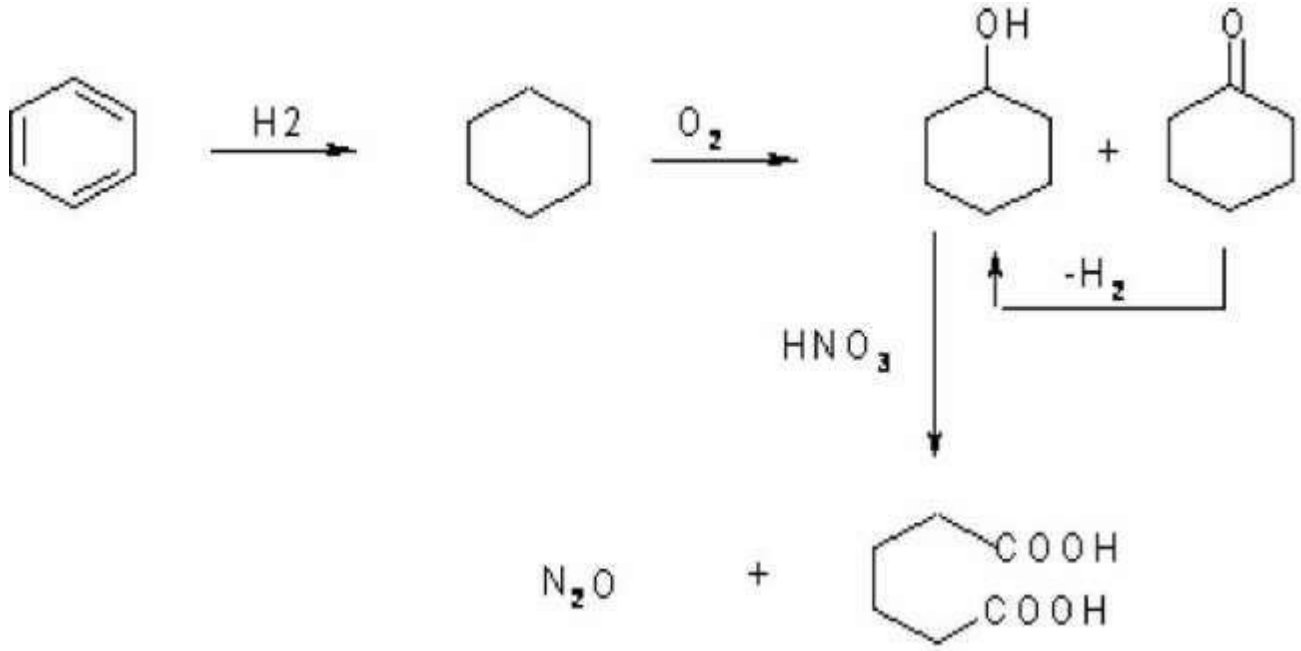
3 .Less hazardous chemical synthesis 4. Designing safer chemicals 5 .Safer solvents and Auxiliaries

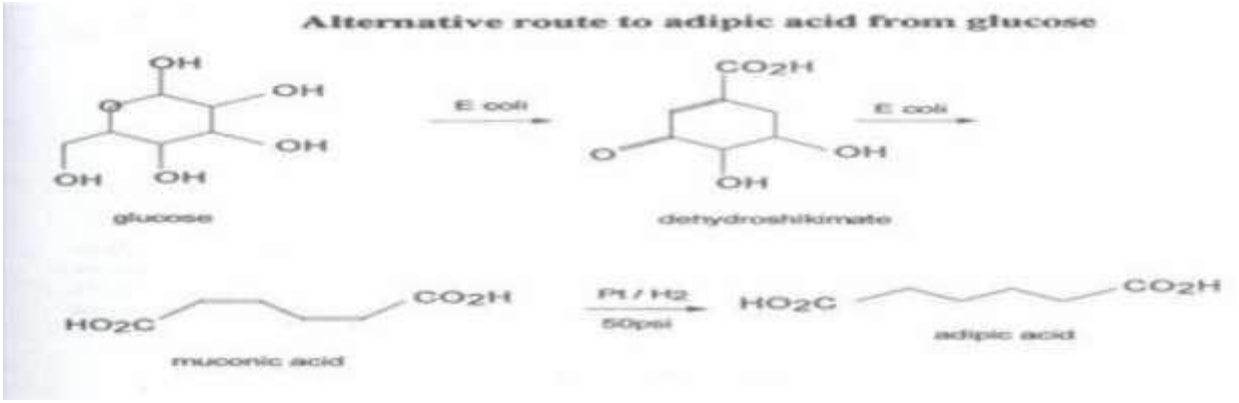
6. Design for energy efficiency
7. Use of Renewable Feedstocks
8. Reduce derivatives
9. Catalysis
10. Design for Degradation
11. Real time analysis for pollution prevention
12. Safer chemistry for Accident prevention

Green chemistry principles- in action:

In some industrial chemical processes, not only waste products but also the reagents used for the production, may cause a threat to the environment. According to the principles of green chemistry, a threat can be eliminated in a simpler way, by applying safe raw materials for production process. Large amounts of adipic acid[8] are used each year for the production of nylon, polyurethanes, lubricants, and plasticizers. Benzene (a compound with Carcinogenic Properties) is a standard substrate for the production of these acid Chemists from State University of Michigan developed green synthesis of adipic acid using a less toxic substrate. Furthermore, the natural source of this raw material, glucose is almost inexhaustible. The glucose can be converted into adipic acid by an enzyme discovered in genetically modificated bacteria. Such a manner of production of this acid guards the workers and the environment from exposure to hazardous chemical compounds.

Conventional route to Adipic acid from Benzene





FINDINGS:

The great threats to the environment are organic solvents applied in many syntheses. They are released into the environment by a volatilization process, especially in the case of volatile organic compounds (**VOCs**) and as a result of leakage. The emission of such compounds is significant because in many syntheses their amount exceeds the amount of reagents. The new solutions for practical synthesis aim at complete elimination of solvents or to substitute the compounds belonging to VOCs by cheap technological media, harmless for humans and the environment. The use of supercritical fluids[8] (**SCFs**) in chemical processes is becoming more and more prevalent. Carbon dioxide as a supercritical lfluid is most frequently used as medium for reactions.It is inflammable, easily available (from natura lsources) and cheap. The discovery of supercritical carbon dioxide opened a way to new processes intextile and metal industries and for dry cleaning ofclothes. Micell Technologies Company offers technology for removal of stains using liquid carbon dioxide instead of the perchloroethylene (**PERC**) more commonly applied.

4. CONCLUSION:

Green chemistry is not a new branch of science. It is anew philosophical approach that through application and extension of the principles of green chemistry can contribute to sustainable development. Presently it is easy to find in the literature many interesting examples of the use of green chemistry rules. Great efforts are still undertaken to design an ideal process that starts from non-polluting materials. It is clear that the challenge for the future chemical industry is based on production of safer products and processes designed by utilizing new ideas in fundamental research. If companies are able to meet the needs of society, people will influence their own government to foster those industries attempting such Environmental initiatives. In this context, chemical sciences will play a key role in the realization of the conditions for a sustainable development with green chemistry strategies. Furthermore, the success of green chemistry depends on the training and education of a new generation of chemists. Student at all levels have to be introduced to the philosophy and practice of green chemistry.

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