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The Effect of Employing Green Chemistry Strategies on Environment

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Abstract
The green chemistry branch is concerned with providing the chemical compounds needed by humans in the safest way and with lowest possible energy resources consumption, to eliminate the pollution of the environment and ensure the restoration of a safe life and a clean environment. In a deep studying to the green chemistry branch and its mechanisms and principles as a science linking chemistry to the environment. The results confirmed the importance of green chemistry and the necessity to grow and develop this branch; also, the results showed the role played by the technological revolution to develop green chemistry and how it recommended with applying Green chemistry strategies in various fields, whether in industrial or even developing countries.
Keywords: key words, orkforce sizing, job-shop production, holonic model

1. Introduction

Recently, Deadly cancers, dry rivers and melting ice caps, toxic water and air have hit the environment of the earth. This case of advanced state of poisoning and pollution was due to emissions of toxic gases such as carbon dioxide, which has depleted the ozone layer and caused a hole in it in addition to Climate changing and what it cause about environmental disasters. All of that led researchers to study how to mitigate the damage of pollutants; particularly those related to chemical industries and how to put legislates work on regulation use of it thus ensure safe use. 1

Kyoto conference is considered the first spark to governments, which assured that the universe would not be viable as long as the environmental pollution created by the industrial revolution has stopped.

No one deny the role of the chemistry contribution to the progress of human civilization but exploitation usage of natural resources led to the depletion of some sources which led the humans to huge increase use of industrial activates which lead, in the end, to more pollution of seas, rivers and air. 2

Not all Efforts and proposed methods in putting borders have been sufficient to put an end to the catastrophic crisis that threatens that the Earth will not be a safe and suitable place to live in this millennium. The deep gap between the environmental situation and the industrial and economic situations cannot be reduce except through creation of a new science search for clean , environmentally and friendly tools to provide basics and humanitarian needs without harming the environment and human and prevent more degradation of the environmental situation this science is called the " green chemistry ".1

Appearance of Supporters to promote environmental awareness

Rachel Carson was the first one who responds to the appeal of nature with her passion. In 1962, she issued a book and its name was "the Silent Spring" which was an early warning to the chemical community. It paid attention to toxicity of chemical compounds and its danger to humans and ecosystems. That results a great impact in forcing governments to upset balances and make drastic changes in their policies towards the environment. The book considered by the masters one of the books that changed the history by preparing the movements of the proponents of the environment to create a new science called Ecology. 1

Diagram 1 shows the amount of waste generated in 1992 from the 10 largest industries in the United States of America. 4

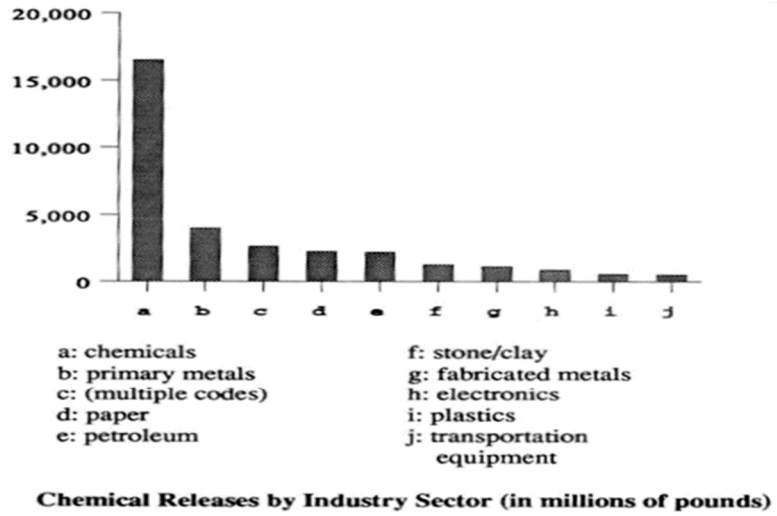


Figure 1: Quantities of chemical emissions from the industrial sector in the United States of America

In the present century, chemicals have caused devastating environmental disasters that threaten human existence and warn with dire consequences.

The "Pollution Prevention" Conference that had held in the United States of America in 1990 was a starting point for the literature and principles of green chemistry and its applications.

One of the most important problems raised was how to reduce pollution in its various forms

The main target for the researchers was about the best ways to get rid of pollution in its first appearance before its transition to the environment; when it will be difficult to eliminate it. 3

This is the fundamental point that distinguishes green chemistry than environmental chemistry.

The chemists and their role in creating a polluted environment

The role of chemist in society has been controversial. Some believe that a chemist is a person who seeks to provide the means of luxury and develop the level of the individual. He invented drugs, fertilizers and pesticides, while others believe that he was one of the demons of the evil who destroyed the world and the environment by inventing weapons of mass destruction Chemical and nuclear reactions that have destroyed millions of people and damaged the environment. 2

There is no doubt that the rush of a chemist to develop and create everything new by focusing on the efficiency of chemical techniques has led to the confrontation of many disadvantages unintentionally to humans and the environment

The chemist must be careful when he design a chemical product, and ensure that the reaction and its products are determined. He has to decide whether the produced wastes would be hazardous or not and if it's poisonous to the workers who work on producing it, and to estimate the cost needed to treat the wastes generated

What is green chemistry and what is the influence to the chemical manufacturing world by establishing the branch of green chemistry?

At the end of the Second World War, the chemical industry emerged as the most important sector of the industry. The societal values towards the chemical industry imposed values to reduce the pollution of the environment. Chemical factories were forced to adopt new bases in the preparation of a new chemical product, taking in consideration additional costs, protect Plant, environment and workers as shown in the following table: 5

New standards	Old standards
Availability of starting materials / price Energy cost / Cost of compliance rules / The cost of waste disposal / Cost of legal responsibilities / Secure Marketing / Discard of the consumer	Availability / price of introductory materials / Nutrition stock /Energy cost

The term "green" is used as a description for all things that are considered environmentally friendly. Green chemistry is the chemistry that provides the needs with the least possible resources and contributes to the use of energy in more efficient and less polluting methods than the methods of chemistry used in modern times. 5

The need to achieve chemical reactions in a more secure and economically cost-effective manner and is at the same time environmentally friendly, Chemistry has been subjected to improvements that have not occurred in any of the scientific branches before, and so green chemistry has emerged. 3

When considering the dangers and environmental disasters that we observe, some believe that they are Spend and destiny in opposite to those who believe that the chemical compounds and their waste and toxicity adversely affect the environment. This has created widespread debate, as the doubts about chemical toxicity and environmental impact are also uncertain about the methods of chemical analysis. The scientific community has two choices:

First, to allow these doubts to obstruct campaigns and attempts aimed to provide a clean environment suitable for human existence and protection of health,

The second choice was to adopt the modern section, green chemistry acceptance and recognition of the negative impact of chemical waste, methods of manufacturing chemicals, and depletion of sources and natural resources. 6

The reasons for achieving the goals of green chemistry and its mechanisms

One of the most important reasons that chemists have to follow the principles of green chemistry is the possibility of producing and manufacturing less toxic alternatives in safer ways, thus reducing the chances of exposure to the environment. If they find the best, they have to follow these methods and conduct the work and use the materials as harmless as possible to the environment.

The reason for the chemical society's application and the application of green chemistry is also due to the fact that the basis for building this chemistry as the most effective method of solving problems is basic molecular science and not for dressing or patching to reduce risk. 4

The issue of the impact to human health and the environment on chemicals and the stages in which they are going through has become clear and clear. Green chemistry has become the primary responsible for finding appropriate solutions to the problems of older manufacturing methods by providing less toxic and safer alternative solutions. 7

The following are the main points that are the cornerstone of green chemistry in the implementation of its foundations:

- Alternative starting materials
- Alternative reagents
- Alternative solvents
- The changes by the goal of the product.
- Changes as to the product's objective Alternative catalysts
- Methods of advanced chemical analysis

Following is a detailed explanation of each of the mechanisms that can be employed to achieve the mechanisms of green chemistry.

Alternative starting materials

Selected initial materials based on chemical efficiency to adopt the way of chemical preparations on the nature of the starting materials and its characteristics and types.

as well as to pay attention to the healthy side of it during dealing, and the potential risks during transportation process , and if the starting material is in a raw material case or recycled, or one of the petroleum products, or is considered one of the vital materials!

While no one deny the risk of completely dependence on oil in most of the chemical industries because the source is non-renewable in addition to the environmental risks accompany to the preparation of the oil compounds, where considered unwanted oxidation of petroleum products, so green chemistry have contributed to provide agricultural products such as wheat, potatoes and soya as raw materials as alternatives to the oil and the preparation of many industrial products such as textiles, nylon and green chemistry had provided another alternative agricultural products as raw materials and agricultural waste biomass, which consist of lignocellulose materials. 9

Reagents alternative:

to convert raw material to a particular product the Chemist must choose reagents for the necessary change in the internal structure of the first molecule and It must assess the efficiency of the reagent and its availability, its safety on the environment, depends on that we determine the best reagents to achieve the required transformation in terms of the method used for interaction, as well as the type of produced wastes , where different way of occurrence, either equal proportions or through the use of agents or the economy of the maize. 10

Alternative solvents:

of the functions entrusted to the green chemistry find appropriate circles to complete the chemical reactions to avert environmental damage further consequences caused by the relevant solvents organic structure such as smog, and has succeeded in finding a green alternatives to maintain clean air. 9

Change the goal of product:

studies aimed at Pharmaceutical Chemistry for the production of compounds with high efficiency with the least possible toxic or the side effects of the conductors, we can say that the Pharmaceutical Chemistry Consistent

with the objectives of green chemistry, the only difference that the green chemistry studies the internal structure of the structure of the particle target preventing any side effects. 10

alternative stimulating Factors:

It was important to find the factors stimulating and alternative incentive factors currently used is the heavy metals of the devastating impact on human health and the environment and latest factors stimulating indolence light.8

ways of the chemical analysis of the evolving:

To Crystallize the economic importance of the study of the chemical reaction when the chemical reactions of the severe.10

Green chemistry's 12 principles:

These principles demonstrate the breadth of the concept of green chemistry:

- Prevent waste: Design chemical syntheses to prevent waste. Leave No waste to treat or clean up.
- Maximize atom economy: Design syntheses so that the final Product contains the maximum proportion of the starting Materials.. Few Waste or no atoms.
- Design less hazardous chemical syntheses: Design syntheses to Use and generate substances with little or no toxicity to either Humans or the environment.
- Design safer chemicals and products: Design chemical products That are fully effective yet have little or no toxicity.
- Use safer solvents and reaction conditions: Avoid using solvents, Separation agents or other auxiliary chemicals. If you must use These chemicals use safer ones.
- Increase energy efficiency: Run chemical reactions at room Temperature and pressure whenever possible.
- 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.
- Avoid chemical derivatives: Avoid using blocking or protecting groups or any temporary modifications if possible. Derivatives use additional reagents and generate waste.
- 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.
- 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.
- 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.
- 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. 6

Examples of green chemistry

The most important examples of the application of the principles of green chemistry could be summarized in the following figure:

Green starting materials Photosynthesis

Green interactions reagents green

Green starting materials:

The articles, which initiate the production of chemical compounds, the green is a word means that these starting materials are not harmful to the environment or renewable

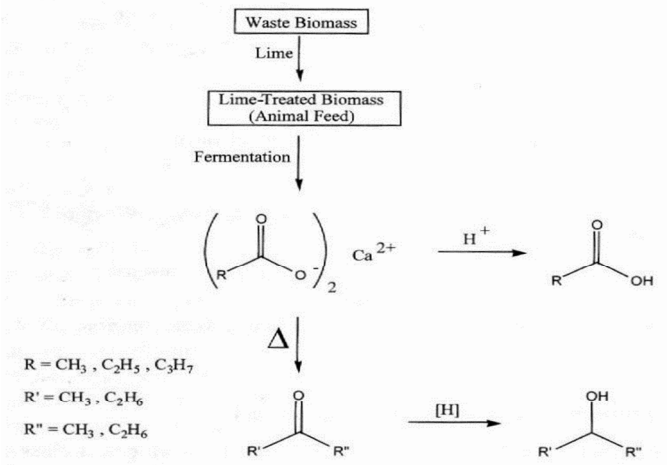
With the development of science and technology green starting materials are intensively used in the industry of organic compounds instead of oil derivatives.11

Moreover, there are examples for the green starting materials

Polysaccharide polymers**:**

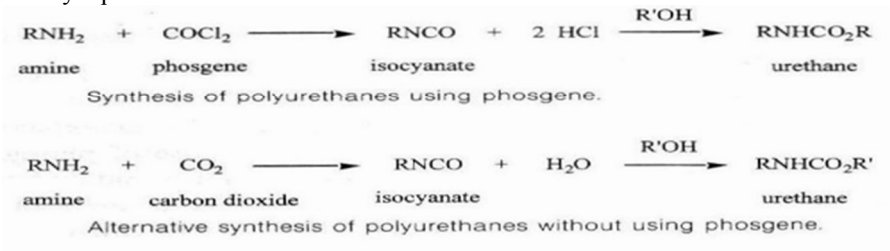
Polysaccharide polymers are renewable materials unenforceable, as well as it biodegradable so it do not constitute a burden on the environment or cause harm to the health and on this basis the Gross used in biosynthesis process the polysaccharide compounds.

Glucose**:**
The aromatic compounds are widely used in industry and they created by using heavy metals as catalysts and organic solvents forst was the first one who prepare the aromatic compounds by biosynthesis by using water as a solvent agent so the glucose became a starting material instead of benzene. 12
Biomass:
The solid waste, sewage, and remnants of agriculture are the remnants of the biomass, which it cause an environmentally and economically burden in case of disposing of it.
Recent studies conducted by researchers of A&M University in Texas reached to technologies for waste conversion of biomass to animal fodder and chemicals could be used in industry.12
These technologies contribute in maintaining the health of the environment; where they convert waste to animal fodder, and provision of fertilizers and pesticides.
Both pesticides and herbicides are pluses solutions to Replace oil in the production of chemicals which work on reducing environmental pollution, where the fuel gross from burning remnants of biomass is free of carbon dioxide, which reduces the phenomenon of global warming.



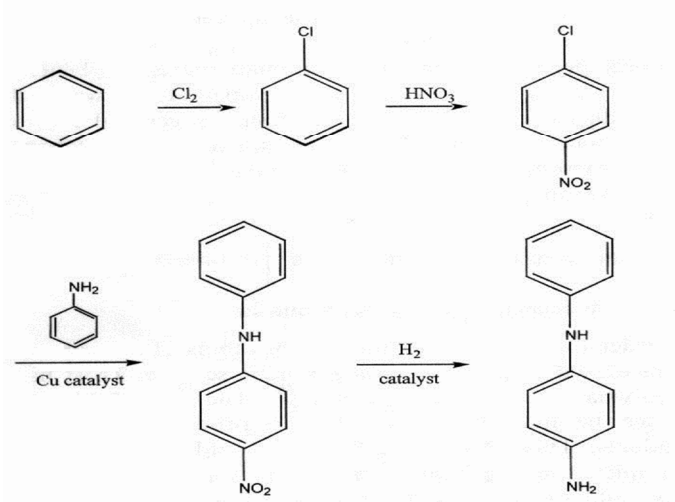
Technologies to convert waste biomass into animal feed, industrial chemicals, and fuels.

Green reagents:
Prepare of polyurethanes and isocyanides without *Phosgene gas:*
Polyurethanes are considered important materials due to its widely usage in industry but the risk in preparing it is the usage of *Phosgene* gas which is poisonous and deadly , recently a new way was found to prepare polyurethanes without usage of *Phosgene* gas
The way as shown by equations:



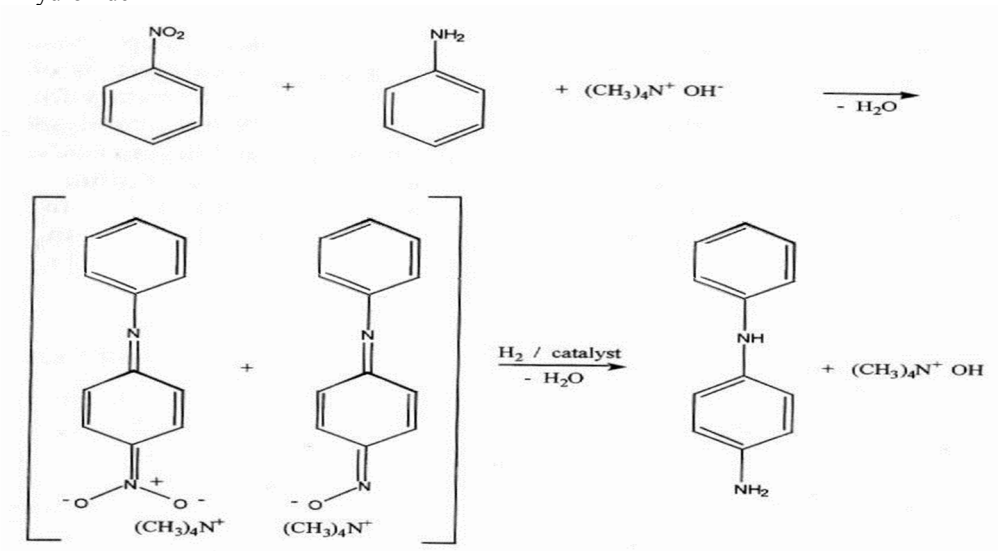
Synthesis of polyurethanes using phosgene.
Alternative synthesis of polyurethanes without using phosgene.

Green interactions:
Atom economy and homogeneous catalysis:
To reduce the unwanted secondary materials from reactions researchers seek to find catalyst help atoms to relate with each other to form a molecule without releasing to any secondary products, this is what is known atom economy. *trost* discovered some catalysts of the transitional metals prevent the production of secondary materials or even formation of it.
Aromatic amines and its formation without halides:
In the past amine compound where prepared by a reaction between chloride atom with benzene ring and the produced product react with nitrogen atom and then a nucleophilic substitution occur to chloride by another group as shown in the figure (preparing of 4 amino di phenyl amine)



Traditional synthesis of an aromatic amine, 4-aminodiphenylamine.

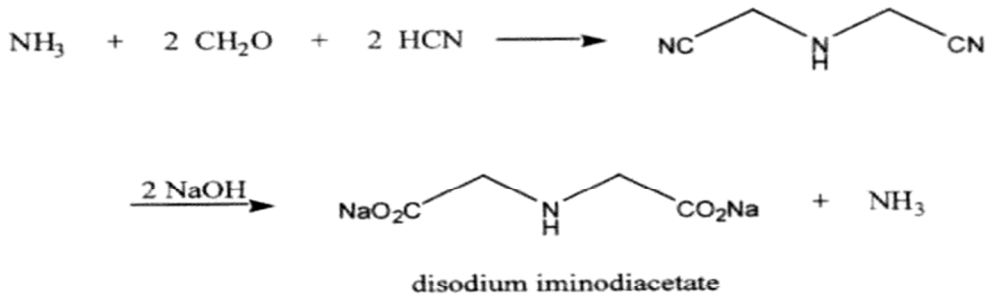
Monsanto aims to produce the same compound using nucleophilic substitution instead of halogens by catalytic hydrogenations of a mixture of tetramethyl ammonium salts producing 4-amino diphenylamine and tetramethyl ammonium hydroxide



New synthesis of 4-aminodiphenylamine avoiding the use of halogenated intermediates.

Preparation of green herbicides:

In intermediate state to prepare green herbicides, disodium iminodiacetate is used , this method require formaldehyde, hydrogen cyanide, ammonia and hydrochloric acid which is traditionally made through streckher process as shown

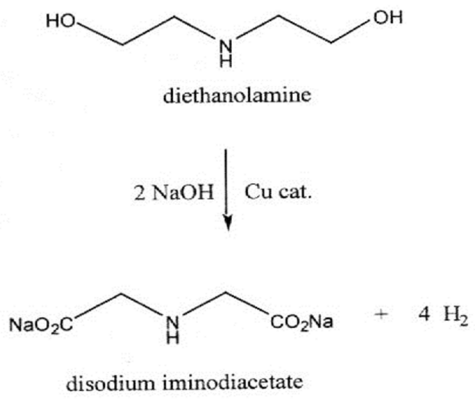


disodium iminodiacetate

The Strecker process for synthesizing DSIDA.

Monsanto decide to search for another way because the intermediate compound above is unstable and hydrogen cyanid is extremely toxic

The new Monsanto process process makes use of a copper catalyst which is used to reduce ethanolamine to DSIDA , the process totally eliminates the use of ammonia , , hydrogen cyanide and formaldehyde are free byproducts



Alternative synthesis of DSIDA using a copper catalyst.

The new Monsanto process can be used in the production of other amino acids, agriculture, pharmaceutical sectors, industry and conversion of primary alcoholic to carboxylic salts

It is a Green Technology does not need to use toxic materials such as hydrogen cyanide and formaldehyde , also it is heat absorbent and which ensure the route of the interactions in addition to the products are much and don't need to purification steps or let any harmful wastes .

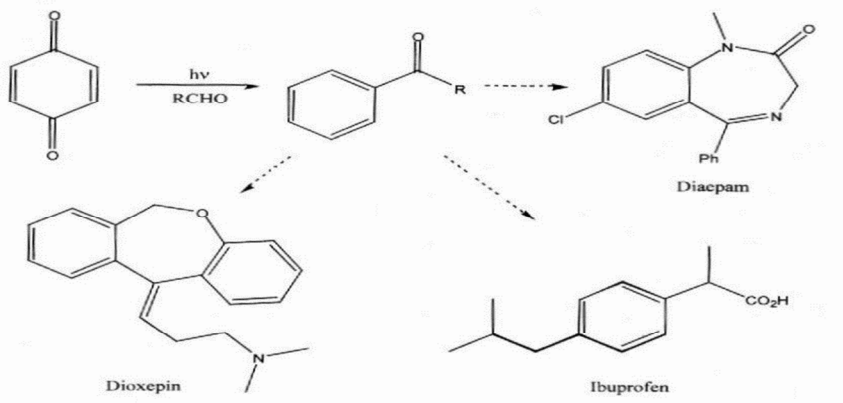
Photosynthesis process:

Photochemistry was a new branch in chemistry which founded by giacomo simian

And its research was talking about the use of chemicals instead of sun light to start the reactions and this was a strong challenge specially in 19 century where he said in his letter to the French chemical community that no doubt that chemical reactions can occur in laboratory as it occur in nature and in the same conditions ,and this was in 1908.

An alternative optical chemical reaction to fidel craft reactions:

Field craft reactions are so important although its catastrophic effect on environment cross try to modify these reactions to be low toxic by making optical chemical reactions on aldehydes and ketones as shown in figure:



The photochemically mediated reaction of aldehydes with quinone.

Moreover, this way have many advantages where it doesn't use chloride solutions which are sensible to the air and Lewis acids and other toxic chlorides such as titanium chloride, aluminum chloride and solvents such nitro benzene

The challenges of green chemistry:

The most important challenges of the employment of green chemistry summarized as the following:

The studies had shown that 80% of dioxin gas move through food, and it occupy about 10% of the air after the emission of the outputs of the burning of waste plastic chlorine origin, either ten percent of the remaining 10% it comes from the water and soil because of the use of pesticides or dumping of liquid waste factories in the soil before the checked to make sure that don't Contain a boat dioxin The emission sources dioxin had diversified

most notably:

- the exhaust of the burning plastic materials garbage medical injection of explosives and venous solution needles and those materials used once thus the crematories waste hospitals is the source of the gas emission dioxin in the atmosphere
- The burning of the material breach of non-full or chemical reactions, such as vehicles, which produces a secondary on interactions of pesticide production grass and disinfectants in some chemical industries.
- During mixing of asphalt burning coal, can also generate dioxin material.

dioxin material considered as a deadly danger facing mankind and the environment as well as a major challenge to the green chemistry as the articles do not decay must be faced and propose alternatives to waste incineration of chlorine origin to get rid of them and their impact.

Asbestos-containing materials: asbestos is one of the challenges facing the green chemistry, have spread warnings across the Reuters news agency. Complimentary newspaper Al-Ahram also which confirms the proliferation and widespread symptoms relations with a large number of victims, it was stated that the rate of infection of people in Britain only exceeded four thousand were threaten men in youth phase, it is mentioned that the European Union had decided to prohibit and prevent all users of asbestos-containing materials until 2005. Asbestos is inorganic materials containing a range of natural metals that enters in structure and silicate salts and reflects the fibers of micro to need a microscope to see that it does not see the naked eye. The feature of asbestos fibers Somkid strength and to the possibility of heat resistance and combustion, asbestos fibers capable of resisting acids and friction.

Can be classified belonged asbestos:

- (serpsntine family): fiber optic feature of this family as linens and flexible, fiber is more widespread in industrial products, fortunately, that the family is less serious, and this family type called (chrysotile), and its fiber have white linens and represent about 90 % of asbestos in the industrial products.
- (amphibole family) and fiber this family characterized as straight a wasteland and fragile, fiber is less widespread than in industrial products and more dangerous, and types of fiber (amosite) which are either brown color or gray, fibers (crocidolie) and its fiber have a blue color.

Where used asbestos fibers?

Due to the solidity of asbestos fibers. Severe strength and its resistance to the headed lure of heat and pressure. Factories integrate to use of its chemical products properties in many industries such as:

- The building of ships.
- Refineries energy units.
- Construction companies and construction of buildings for building materials to resist fires and isolate voice and heat.
- Textile industries.
- Set the parking brake and structures of cars.
- The wiring electrics and the isolated spacer's tubes bricks and separating fence cement asbestos.
- Hairdryers.
- Home furnaces

Why is asbestos danger and challenge of green chemistry?

Asbestos is environmentally pollutant where lies the danger to human health if it is inhaled, happens in cases of breakage or cracking of material containing asbestos fibers micro, asbestos fibers when united with other articles rarely rising to the surrounding environment, if the danger of the use of the intervention of the csts as currently composed were asbestos fibers increasingly when cracks displacements where asbestos fibers that cannot be seen with the naked eye, which makes it more difficult to get rid of them, what is even worse is that the safety limit exposure to asbestos fibers almost 0 severe danger and especially on children, unfortunately, used asbestos fibers to build hospitals, schools, and homes.

Affect the proportion of the focus of asbestos fibers in the air and time of exposure, type, size and shape as well as the degree of assimilation of the severity of the injured individual.

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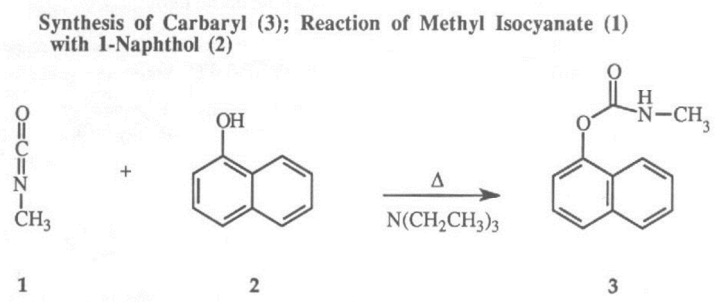
Environmental woes home chemical intractable green chemistry: one of the most prominent of the chemical substances that may result in view of the daily practices at home are as follows:
smoke killer cooking:
It is estimated suspicious deaths resulting from the gases emitted during the process of cooking 20 people per second per in developing countries where the smoke houses the fourth cause of death, disease and chronic pulmonary especially acute in the countries of the world and the poor countries, where the killing of 1.6 million people per year, the emission of carbon monoxide gas cooking, to constitute a methane biggest source, what is the only liquefied gas output water on the liquidation of the crude oil, presses in the CD.
It features a methane gas that bland, color or smell, inflammable, as well as severe explosion, the smell of gas distinctive cuisine is only added material sulfuric and reduce the oxygen makes it a suffocating gas not Sama household cleaning products and personal care products:2
there are more than 4.5 billion chemical substance known through history according to issued by the Research Center of America, 50 thousand of them are circulated to deal to commercial and industrially, 80% of these articles only know the characteristics of their toxic wastes. Either to examine the severe impacts resulting from the use of daily individuals did not held only less than 20% only of these articles, where the examination of chronic effects of cumulative adverse effects on the health of the individual reproductive health and genetic leaps is not less than 10% of these articles only.What is even worse is that most of those tests were held each, did not hold any test on the interventions of mergers and those articles or even the damage resulting from the interactions between them, which mostly carrying harmful and dangerous more deadly.
Chlorine
of materials that are used on a daily basis and periodically and install the chemical weapons are chlorine, unfortunately, solve the chlorine in everywhere, it exists in drinking water bathing water, and used wrongly unstudied in the cleaning, it is indeed regrettable used in some of the country as a chemical cheap sterilization of drinking water, scientific research proved that the chlorine substance had topped the list of carcinogenic materials and that it may be fatal
Uranium hexafluoride
Add a uranium hexafluoride to water without the feasibility, where it learned of the most toxic materials and the most dangerous.
Disinfectants
Disinfectants usually contain articles phenol or cresol has corrosive effects, known as the vehicles had caused a breakdown in the nervous ends of sensory, as well as may attack the liver, kidneys and spleen pancreas and central nervous system(.
Over Deodorants
air للمعطرات capacity to disable the sense of smell in a normal manner, after disabling the nerves of smell peripherals, and packing the corridors nasal sinuses a layer of oil known as methoxychlor is one of the types of pesticides, which accumulate in the fatty tissue of causing the excitement of the central nervous system,22)!
The technological revolution and its role in the evolution of the green chemistry
tops the creation and preparation of chemical compounds the main sources of pollution because many of the articles of the prefix and solvents used the outputs of the Secondary interactions have toxic high, given the cost of high economic treatment and disposal. Chemical felt that it would be feasible to search for modern methods to reduce environmental pollution resulting from the production of chemical compounds.
Recently the prototype of the adoption of macroeconomic policies on the computer where the design of cloned industry and chemical compounds of vehicles in the Friendly Green environment rather than vehicles with high toxic substances used in prepared earlier.
Where the use of the computer in 1967, and his colleagues Korean first worked on the creation of chemical compounds, development of approximately 50 a program for this goal, namely, to assist the chemists to use more secure to prepare chemical compounds, divided into those programs to two types depending upon the manner in which the followed by:
First: where the preparation of chemical materials friendly green environment rather than those that have been used before.
Second: After the identification of the prefix and conditions of interaction is the preparation of chemical compounds, where conditions appropriate interaction and outputs of the chairperson and secondary schools is also likely composed of interaction.(25(
The programs used in this area are:
CAMEO
Lhasa
SYNGEN
these differ three programs and how to translate the chemical information to the purposes of morphological, where users CAMEO(need prefix materials and the composition of the outputs and then the application of a

series of rules specifically designed to determine the installation and activity and effectiveness. While the program user SYNGEN & Lhasa to the preparation of the vehicles had already been prepared through the development of targeted composite thus get prefix materials outputs of the program.LHASA can draw information to approximately 1,000 interaction, in order to propose an appropriate method used cloned composite required.While program uses SYNGEN sports ways for storage of installation and conditions of chemical reaction to know the best way of preparing possible in one operation.
In addition, some examples of the successful those programs in the creation of vehicles green membership:

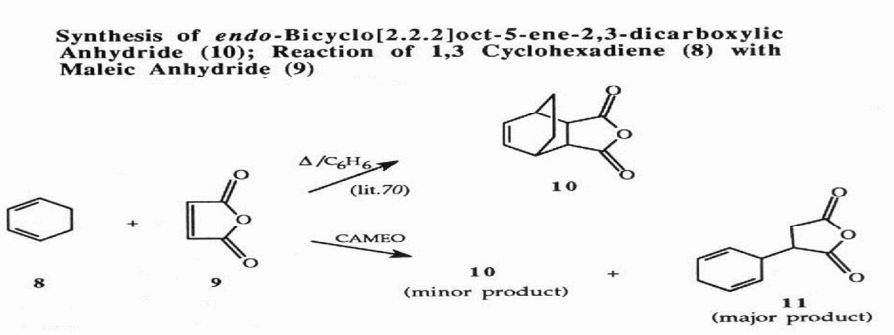
- Synthesis of carbaryl : reaction of methyl isocyanate with 1-naphthol



reaction Has been verified by the CAMEO no secondary outputs of this interaction may affect the environment and thus considered the interaction of a friend of the environment continued strategies of green chemistry.

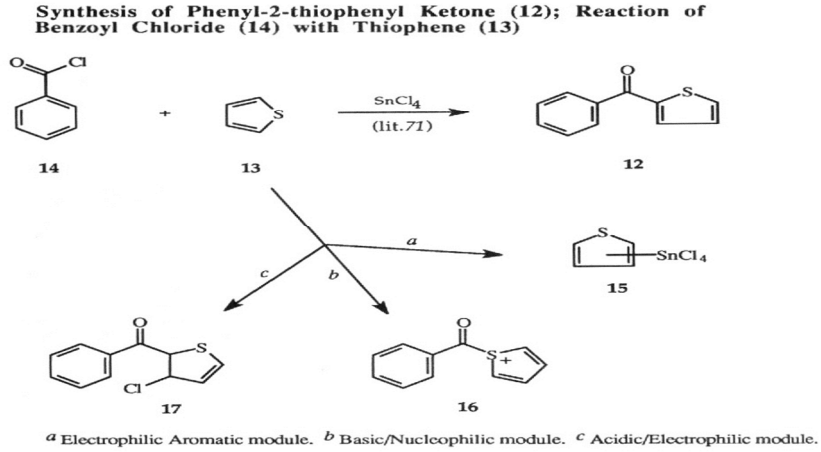
- Reaction of cyclohexadiene with malic anhydride:

In normal conditions compound number 10 is produced by diels alder reaction but when we use CAMCO programme compound number 10 is produced as a secondary product although the main compound is number 11 which has no bad effect on environment



- Reaction of Thiophene with Benzoyl Chloride:

Although CAMEO program did not success to have a reason in for formation of compound number 12 that produces by interaction of Friedel Parian but it was able to predict several other compounds such as (15), (16), (17) which follow the strategies of green chemistry.



[a] Electrophilic Aromatic module. [b] Basic/Nucleophilic module. [c] Acidic/Electrophilic module.

Results and recommendations

if the continuation of life on the planet to be recruitment strategies for green chemistry in the area of chemical industry, especially areas of industry in general, where pollution not be eradicated only through a green plans to

reduce the toxic waste and reduce the depletion of natural resources.
One of the most important factors of the application of the strategies for green chemistry is familiarity interactions chemical waste perception that result in the composition of the materials and study the conditions of interaction to try to search for other tracks safer than the traditional routes.
It is already the researcher recommends:

- the need to apply the strategies for green chemistry in various areas in both industrialized and developing countries to green chemistry of sound health and green environment.
- environmental awareness among the members of society and to enact legislative laws strict measures to prevent the circulation of vehicles and dangerous chemicals and find an alternative green instead.
- the need to expand and increase studies and research in the field of green chemistry is the only solution to get rid of the pollution of the globe who arrived at an advanced stage.

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