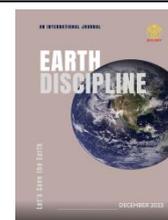


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Research Article

Green chemistry's critical role in pollution prevention

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ABSTRACT

In general, "green chemistry" refers to the substitution of less harmful components for hazardous ones throughout the production, use, and disposal of products. Green chemistry aims to lessen pollution and the effects of product disposal and industrial waste on the environment by including more environmentally friendly chemicals into the design and production processes. In this domain, SRC (Selective Catalytic Reduction) has shown leadership, particularly in locating and evaluating safer alternatives. The design of chemical products and processes that minimise or completely do away with the usage or production of dangerous materials is known as "green chemistry." Green chemistry covers all aspects of a chemical product's life cycle, including its creation, application, and final disposal. Sustainable chemistry is another name for green chemistry. The strain that human activity is placing on natural resources is growing daily, and if it keeps up at this pace, life on Earth will become unsustainable. Therefore, action must be taken to lessen this pressure. A large number of scientists and environmentalists are developing methods to lessen pollution in the environment. Apart from the typical home trash bins, there are other types of waste such as industrial, mining, medical, and agricultural waste. The main cause of environmental pollution is inappropriate garbage disposal. As a result, it's important to monitor garbage disposal.

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Introduction

The design of chemical products and processes that minimise or completely do away with the usage or production of dangerous materials is known as "green chemistry." Green chemistry covers all aspects of a chemical product's life cycle, including its creation, application, and final disposal. Sustainable chemistry is another name for green chemistry. By reducing or eliminating the risks associated with chemical feedstocks, reagents, solvents, and products, green chemistry minimises pollution at its source [1]. The effects of mutagens; pollution control methods and devices; waste management and treatment; industrial pollution; air and water pollution and treatment; human influence on the environment; environmental sustainability and development. Environmental pollution is caused by the generation of trash and its inappropriate disposal, both in the home and in industry. Sewage and municipal trash are considered residential waste, while inorganic and organic soluble matter as well as suspended particles are considered industrial waste. Gathering rubbish in bins is one of the greatest ways to manage waste, particularly household waste.

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To minimise the additional labour that municipal personnel must do to separate biodegradable and non-biodegradable garbage, it is best to gather them into different containers. This domestic garbage is moved to communal bins, where it is picked up by city employees and dumped at designated disposal locations. At these locations, municipal employees sort the garbage into categories such as biodegradable and non-biodegradable. Household garbage that decomposes naturally includes things like leftover food and vegetables, whereas non-biodegradable waste is made up of things like paper, plastic, and metal scraps (2).

Recycling:

This is the most straightforward way to handle the garbage. Recycling materials lowers the cost of disposal and saves a significant portion of the cost of raw resources. Typical instances of recycling by industry include: steel production from scrap metal, energy recovery by the burning of naturally flammable trash, the utilisation of waste paper, To put it another way, recycling turns trash into money and glass recycling.

R stands for "sustainable development."

Reduce, Reuse and Recycle:

Treatment of Sewage:

The following three categories of phases are included in the sewage treatment:

- Removing big solid particles is the initial step, or Primary Treatment. Screening and sedimentation are two mechanical processes used to accomplish this. To do this, several kinds of screens are used to filter the waste. The following stage involves sorting and disposing of solid garbage in landfills. After that, it is permitted to enter sedimentation tanks. Solids that settle out may be removed using this procedure (sludge). Grease is also removed by this method; it floats to the top and may be skimmed off.

- The biological oxidation of waste materials' organic content by microorganisms is the second step, referred to as secondary treatment, and is followed by filtering.

- After primary and secondary treatments, the third stage, often known as final treatment, involves a number of specialised physical and chemical procedures that aid in lowering the concentrations of certain contaminants that are still present in the sewage. Following this procedure, the waste water's quality improves. Activated charcoal treatment, reverse osmosis, chlorine disinfection, coagulation, filtering, chemical phosphate removal, and other techniques are often used in this treatment process[3].

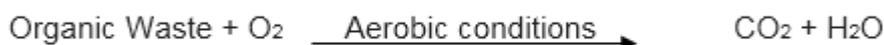
Sludge is created during these procedures, which further complicates proper disposal. After drying, the sludge is either digested, soaked, or burned, as will be discussed later.

Types of Sewage Treatment Processes

Burning

Organic compounds are converted into CO₂ and water as a result. This is used to dispose of domestic garbage, chemical waste, biological waste (from hospitals, for example), etc. The majority of these treatments take place in aerobic environments, which are very hot (over 1272 K) and oxygen-rich. Exhaust gases go through filtration. As a result of this procedure, less trash is produced, and the inorganic ash that remains is dumped as land fill [4].

Process of Incineration



By using this technique, we may dispose of relatively harmless PCBs (polychlorobenzenes) with ease. Additionally, since this process includes endothermic reactions, the high temperature produced enables the organochlorine compounds' C-Cl bonds to be broken. The primary drawback of this procedure is that it pollutes the air. Furthermore, the tiny ash particles released by municipal incinerators are readily ingested by humans due to their small size. Polychlorodiben-zodioxin-like compounds (PCDDs) and Polychlorodibenzofurans (PCDFs) were examples of very dangerous chlorine compounds that may be formed when PCBs are not completely burned.

Digestion:

Anaerobic digestion of sewage allows microorganisms to break down wastes without the presence of oxygen during the digestion process. This method may be used to decompose a broad range of organic wastes that are hazardous. Methane and carbon dioxide, which may be used as fuel, are the byproducts of digestion [5].



Dumping:

The practice of disposing of sewage sludge in the neighbouring oceans is common. We call it ocean dumping. On the other hand, more sludge is being applied to the ground. The phosphate and nitrogen in the sewage make it possible to utilise it as fertiliser. Unlawful dumping of hazardous trash that is not segregated. Because harmful materials make up the majority of the sludge generated by metropolitan areas, it must be disposed of safely and under strict oversight.

Green Organic Analysis:

Conventional organic analysis involves the fusion of organic compounds with sodium metal, which is very dangerous and may catch fire when exposed to moisture or water. There are moments when it bursts fiercely, even hurting the pupils' eyes. Sodium bicarbonate and zinc dust have been suggested as a safe and non-hazardous substitute for metallic sodium in this process [6].

Use of Nonpetroleum fuels:

1. Power Alcohol: Ethyl alcohol is referred to as "power alcohol" when it is used in internal combustion engines. To raise its octane number, it is combined with petrol at a 4:1 ratio. Since molasses, a dark brown mother liquor leftover left over when sugar crystallises, is used to make ethyl alcohol in India, a significant quantity of residue is consumed, which lowers pollution.
2. Benzol: During coal carbonisation, it is produced as a byproduct. Additionally, fractional distillation of light oil yields it. It is a blend of several hydrocarbons containing 70% benzene, 18% toluene, and 6% xylenes. Because of its excellent anti-knocking value, it may be added to motor fuels, which lowers fuel consumption and the production of harmful pollutants [7, 8].

Conclusion:

Even if there are many innovative green chemical processes being created, there are still a lot more obstacles to overcome. Many attempts are being made to create safer goods with no byproducts and to develop non-polluting starting materials. It has been suggested to develop better equipment and fuels that emit less harmful exhaust gases, such as CO, CO₂, SO₂, nitrogen oxides, etc., which cause air pollution and eventually ocean acidification. Reducing the amount of heavy toxic metals and other harmful compounds added to the environment may also be achieved by using high-quality fuel and adapted green procedures. VOCs are added to the environment less often when chemical operations are conducted without the use of solvents or when water is used in lieu of organic solvents. The quantity of heat energy and reaction time have both decreased when chemical operations are conducted in a microwave. The three tenets of green chemistry—reduce, reuse, and recycle—will lessen pollution in the surrounding ecosystem as well as marine debris. The biggest issue is implementing green chemistry into daily, industrial, and laboratory activities to reduce environmental contamination and, therefore, ocean pollution at its source. Even though there have been a number of successful attempts, much work remains. This may be accomplished via teaching and training the next generation of chemists.

References:

- [1] Sharma, U., Bora, U., Boruah, R.C. and Sandhu, J.S. 2002. Tetrahedron Lett., Rummi Devi Saini 43: 143–145.[CrossRef],[Google Scholar]
- [2] Boruah, A., Baruah, M., Prajapati, D. and Sandhu, J.S. 1998. Synth. Commun., 28: 653–658. [Taylor & Francis Online], [Web of Science ®],[Google Scholar]
- [3] Borah, H.N., Boruah, R.C. and Sandhu, J.S. 1997. Ind. J. Chem., 36B: 384– 386. [Google Scholar] [28] Baruah, A., Baruah, M., Prajapati, D. and Sandhu, J.S. 1996. Chem. Lett., 25: 965–966. [Google Scholar]
- [4] Ember, L. Chem. Eng. News July 8 , 1991 , pp 7 – 16 . <http://helios.unive.it/inca/>; <http://www.chemsoc.org/networks/gcn/> [Google Scholar]
- [5] Anastas , P.T. ; Heine , L.G. ; Williamson , T.C. Green Chemical Syntheses Processes: Introduction ; American Chemical Society: Washington, DC , 2000 ; Chapter 1 . [Google Scholar]
- [6] Anastas, P.T. and Lankey, R.L. 2000. Green Chem., 2: 289–295. [Google Scholar] [6] Anastas, P.T. and Warner, J.C. 1998. Green Chemistry: Theory and Practice, 30New York: Oxford University Press. [Google Scholar]
- [7] Walden, P. Bull. Acad. Imper. Sci. St. Petersburg 1914, 8, 405 – 422 . [Google Scholar]
- [8] Welton, T. 1999. Chem. Rev., 99: 2071–2084. [CrossRef], [PubMed], [Web of Science] [Google Scholar]