



## Green Chemistry and Its Applications

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Dear Colleagues,

Green chemistry is defined as “the design of chemical products and methods that eliminate or remove the practice and generation of unsafe and hazardous materials”. It is also called Sustainable Chemistry. The exponential growth of the population has emerged in the drastic debilitation of non-renewable fossil resources and an enormous rise in atmospheric carbon dioxide which led to severe energy and environmental crisis. Consequently, it is highly urgent to develop renewable energy to meet the sustainable development of society. Many Chemical Industries mainly pharmaceuticals encounter critical environmental issues for many years. Most of the chemical products have good applications but these compounds produce hazardous waste that is not eco-friendly.

Moreover, keeping natural resources on earth without using harmful materials is the prime goal of green chemistry. Also, it was found that it is critical to develop substitute technologies that are safer for both human health and the environment. Furthermore, through various methods of green chemistry environment can be preserved. Nearly most of them are biocatalysis, usage of alternate repeatable raw materials (biomass), diverse reaction solvents (such as water, supercritical fluids, ionic liquids) alternative reaction circumstances likewise Electron beam irradiation method, new photocatalytic reactions, microwave irradiation, radiolysis, ultrasound irradiation etc.

With the introduction of 12 principles of green chemistry, guidelines were provided by the OECD (Organisation for Economic Cooperation and Development) for chemists to develop clean environment-friendly methodologies

that are sustainable for the long term. These principles incorporate: Less hazardous chemical synthesis, atom economy, prevention, designing safer chemicals, design for energy efficiency, safer solvents, reduced derivatives, use of renewable feedstock, catalysis, design for degradation, inherently safer chemistry for accident prevention, and real-time analysis for population prevention.

### Applications of Green Chemistry

Green chemistry is broadly utilized in the Pharmaceutical, chemical, paper, polymer, clothes and color industry. It plays a significant role in the manufacture of innovative techniques to make solar cells, fuel cells, and batteries for conserving energy. In addition, Nanoscience technology also contributes towards green chemistry by using eco-friendly green methods of nano-particles. For instance, the synthesis of silver nanoparticles was performed with the usage of carboxy methyl cellulose (CMC). Since the main goal of green chemistry is to minimize or eliminate waste in the chemical industry, it has inspired the creation of many green “next-generation” catalysts. Furthermore, many pharmaceutical industries have also chosen for greener approach for the synthesis of several medicines likewise BASF, a chemical company prepares Ibuprofen (pain killer) with a three-step process rather than a five-step process. Similarly, many medicines including Simvastatin (antihyperlipidemic), and Paclitaxel (Anticancer) are now being synthesized via green chemistry which contributes much less hazardous waste to the environment.

To summarize, the ultimate goal of Green chemistry as revealed earlier is grounded on twelve principles which intended to decrease harmful materials from the production and application of chemical products. In addition, while designing a green chemistry process, it is impossible to follow the requirements of all twelve principles of the process at a time. However, it tries to smear countless ideologies as likely throughout the process of synthesis. The aim of green chemistry in both eco-friendly and fiscal gain can be accomplished via numerous instructions. For example, chemical products would be prepared in such a way that the degradation products so formed are less hazardous to the environment. This can only be achieved by using eco-friendly reagents during the synthesis. Hence, it

is critical to progress alternative technologies to avoid any further damage to health and the environment. Furthermore, environmental management can be conceivable via the introduction of a green chemistry process. Its success also depends upon the right training and education for the students as well as synthetic chemists about green chemistry methods and approaches. Green chemistry is a novel futuristic approach and expanding so rapidly to open the path for the advancement of Science and Technology. However, green chemistry alone cannot solve the pressing environmental concerns and impacts on our modern era but incorporating the twelve principles of green chemistry into practice will finally assist to pave the system to a world where the grassland is greener and safe.



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