

# Research on the Application and Development Status of Green Chemical Technology in Pollution Control

Xin Liu

Nanjing University of Information Science and Technology, Nanjing, China.

## Abstract

Under the favorable and stable economic environment, science and technology have made rapid progress, and technological changes have brought more technological achievements. People's material living conditions have also been improved, but the environment has been seriously polluted. Green chemical technology has emerged as the times require. This is a brand-new environmental pollution control technology, which can not only relieve the working pressure of environmental protection, but also effectively balance the natural ecosystem, and at the same time will not cause serious secondary pollution to the natural environment. Chemistry is a kind of pollution-free environmental pollution control technology based on energy saving, consumption reduction and waste discharge reduction, which uses chemical raw materials, preparations or chemical treatment technology to eliminate toxic and harmful wastes. It can prevent environmental pollution from the source, effectively protect the ecological environment, and realize green chemical reaction without generating any wastes and pollutants. In this paper, the green chemistry technology is analyzed, and its application and development are studied.

## Keywords

Pollution control, green chemistry, green development.

## 1. Introduction

In recent years, the global industrialization is developing rapidly, and the number of toxic and harmful substances produced by industrial production enterprises is increasing year by year, which makes the impact of environmental pollution increasingly serious, and at the same time, the scope of influence is constantly expanding, which will not only affect the present generation, but even threaten the survival of future generations. Therefore, environmental pollution control has become the most important task at present. Green chemistry, also known as environment-friendly chemistry, is the combination of traditional chemistry and the concept of sustainable development, resulting in a new scientific field, which can prevent environmental pollution from the source and effectively protect the ecological environment. This technology is to realize green chemical reaction without producing any waste and pollutants. In the process of environmental pollution control, green chemical technology, as an emerging technology, has gradually won the favor of various industries. It can control and protect the environment and achieve zero pollution effect. In the process of control, it can effectively reduce the secondary pollution to the environment, at the same time guarantee the scientific control effect, save natural resources, promote the development of natural ecology and ensure the harmonious coexistence between man and nature. It is worth popularizing and further studying. Therefore, if we want to effectively strengthen the environmental pollution control and protection work, we still need to pay attention to the application and research of green chemical technology, and constantly innovate and develop green chemical technology, so as to effectively solve and deal with the environmental pollution problem at the source. This paper analyzes and explores the

application of green chemical technology in environmental pollution control and protection, and puts forward some corresponding application strategies and directions.

## 2. Research direction of application of green technology in environmental pollution and treatment

When an environmental problem becomes a "real threat", it becomes a security problem when emergency measures and actions outside the regular political procedures are needed. Once an environmental problem becomes a security problem, it will become very expensive and difficult to solve. Therefore, economic and effective measures must be taken to prevent the environmental damage. The state of environmental problems in recent years is shown in Table 1.

Table 1 Status of environmental problems

	A decreasing pressure	Uncertain areas or potential problems	Non-point source environmental pressure or environmental problems with negative trend in recent years.
environmental pressure	Industrial point source pollution	Use of water	Agricultural pollution
	Some air pollutants	Emission of toxic substances from industry	Overfishing
		Generation of harmful solid wastes	Greenhouse gas emissions
		Generation and utilization of energy	Generation of domestic garbage
			Emission of gaseous pollutants from motor vehicles and aviation

For these environmental problems, we need the development of green chemistry technology. In the process of green chemical technology development, we should take effective environmental construction measures, actively develop modern technologies such as pollution control and cleaner production, focus on improving the utilization efficiency and recycling efficiency of resources, and realize the harmless discharge of resources. On the one hand, we should prevent and control pollution from the source, and greatly reduce the generation of pollution sources through the reaction between chemicals; On the other hand, it is necessary to have higher conditions in the reaction process. For example, some chemical technologies require that the treatment process be non-toxic and harmless, and in addition, the substances produced by the reaction of green chemical technologies require no pollution to the environment, effectively reducing the secondary pollution rate.

### 3. Application fields of green chemical technology in environmental pollution control

#### 3.1. Air pollution control

The source of air pollution mainly comes from industrial waste gas and motor vehicle exhaust, and the main components of pollutants are shown in Table 2.

Table 2 Main Components of Air Pollutants

N- paraffin	amino acid
Dactylogene	hydroxylamine
Polycyclic aromatic ketone	Polycyclic aromatic hydrocarbons and polycyclic aromatic hydrocarbons containing oxygen, nitrogen and sulfur
Aromatic polycarboxylic acid	Lower aliphatic alcohol
Higher aliphatic alcohol	nitrophenol
Aliphatic aldehyde	nitrogen dioxide
Aliphatic ketone	sulphur dioxide

These particles that can enter the lungs are harmful to human health, and they can easily enter the body through the respiratory system, causing various diseases. Coal desulfurization can reduce sulfur dioxide pollution. In order to ensure the best desulfurization effect, in recent years, environmental protection departments have vigorously promoted green chemical technology, and started from the source of fuel, and applied a new clean coal technology in industrial production. This technology can effectively reduce the content of sulfur dioxide, thus achieving the purpose of improving the atmospheric environment. At the same time, technicians analyze the specific components of air pollutants, and then use green chemical cleaning technology to absorb and decompose harmful substances such as nitrogen oxides, suspended particles and sulfur dioxide in the atmosphere, effectively reducing the frequency of acid rain and smog.

#### 3.2. Water pollution control

Waste water is a kind of pollutant that often appears in production and life. Because of the different sources of waste water, the substances contained in waste water are quite different. Industrial wastewater contains a lot of harmful substances, such as heavy metal elements, radioactive substances, acid and alkali ions, etc. If these substances are not handled well, they will do great harm to the land environment, biodiversity and human health. Among the green chemical technologies, the zero sewage discharge technology of circulating cooling water can be used to treat industrial production wastewater, which can effectively prevent the occurrence of regenerated waste brine and boiler water. Combined with regular drainage, the pollution degree of water resources can be effectively reduced. To control water pollution and develop water treatment technology, the key point is to avoid secondary pollution, low energy consumption, low toxicity and high efficiency. In order to strengthen the comprehensive treatment effect of water pollution, a variety of technologies can be combined, including biological oxidation technology, non-toxic agent oxidation technology, electricity, magnetism, sound and light technology, etc., to ensure that green technologies are effectively integrated into the water treatment system.

#### 3.3. Solid waste treatment

With the acceleration of industrial development and the development of production and life, more and more solid wastes are produced. At present, there are two main methods to treat solid wastes in China, one is landfill and the other is incineration. These two methods need to occupy a large amount of land resources, while incineration will cause secondary pollution to

the atmosphere, and neither of them can be completely harmless, but only partially harmless. Solid wastes come from a wide range of sources, mostly from production and living wastes, domestic wastes, mine wastes, etc. Different treatment methods are needed for different wastes. In the treatment of these solid wastes, ionization gasification technology and thermal separation coal preparation technology among green chemical technologies can be used, so that these solid wastes can be treated harmlessly to avoid environmental pollution, and at the same time, the purpose of saving energy can be achieved.

#### **4. Development of green chemical technology in environmental pollution control**

(1) In the existing chemical production, it is inevitable to use some toxic and harmful raw materials, such as highly toxic phosgene, hydrocyanic acid, harmful formaldehyde and ethylene oxide, which seriously pollute the environment and endanger human health and community safety. It is one of the important tasks of green chemistry to replace them with non-toxic and harmless raw materials to produce various chemical products. We need to actively apply green raw materials. At present, most chemical raw materials mainly come from petroleum. In the industrial production process, after petroleum is decomposed, a large number of toxic and harmful substances will be produced, which will cause serious pollution to the air and water. At this time, it is necessary to use green raw materials in green chemistry technology to solve this problem. Green raw materials can play the role of green raw materials instead of toxic and harmful raw materials.

(2) In industrial production, the use frequency of catalyst is relatively high. In the past chemical reactions, the catalysts used will more or less cause certain corrosion to some mechanical equipment, and may also cause damage to human body. After the chemical reactions, certain waste residues will be produced, which will cause certain pollution to the environment. Considering the requirements of green environmental protection, in recent years, experts in the industry have repeatedly carried out experiments and research around the greening of catalysts, aiming at improving the environmental pollution situation in the industrial production process by developing green catalysts. At present, liquid acids such as hydrofluoric acid, sulfuric acid and aluminum trichloride are generally used as catalysts for alkyl reaction of hydrocarbons. The common disadvantages of these catalysts are serious corrosion to equipment, harm to people, waste residue and environmental pollution. Therefore, researchers at home and abroad are vigorously developing solid acid alkylation catalysts from new catalytic materials such as molecular sieve, heteropoly acid and super acid, which can optimize the whole chemical reaction process, prevent the use of toxic catalysts and effectively improve the environmental protection.

(3) Generally, the pollutants related to chemicals are not only related to raw materials and products, but also related to the solvents used in the manufacturing process. At present, the widely used solvents are mainly volatile organic compounds, some of which will cause the formation of ground ozone layer, while others will cause water pollution. At this time, it is necessary to make use of the advantages of green chemical technology and adopt nontoxic and harmless solvents to carry out corresponding chemical reactions. Secondly, the adopted raw materials have low pollution, and the green characteristics of raw materials of green chemical technology can effectively promote environmental pollution control by using raw materials with low pollution in the process of energy development and utilization.

(4) Green products are consumables that are frequently used in people's daily life, and these products will not cause harm to human body and secondary pollution to the surrounding environment. For example, green latex paint, the formaldehyde content of which is completely within the national standard range, will not cause any harm to human health. As for the

treatment methods of white pollution, due to the non-degradability of white pollution, it is necessary to strengthen the research on green degradation technology, or green biodegradable plastics can be used to replace this white pollution raw material, thus effectively reducing the pollution degree to the environment. Nowadays, shopping bags made of recycled paper are widely used in many areas in China, which can not only save a lot of precious resources, but also reduce the pollution to the natural environment. However, this is only to reduce the pollution. Therefore, developing biodegradable plastics through green chemical technology will solve the problem of white garbage pollution from the root, and it is one of the future research directions of green chemical technology.

## 5. Conclusion

With the increasing global environmental pollution, the sharp decrease of energy and resources, and the gradual improvement of public environmental awareness, green chemistry will surely become the theme of the 21st century. For the whole industry, the study and implementation of green chemistry are strategic measures to improve efficiency, save resources and energy, improve the environment and maintain sustainable development. As an advanced technical means of ecological environmental protection, green technology is a cutting-edge technology at this stage, which can make full use of and save natural resources, and has outstanding utilization value and wide application space in various environmental pollution control. Using it in environmental pollution control links can continuously improve the intensity of control work, further reduce the degree of environmental pollution, and even eliminate pollutants, making great contributions to China's environmental protection and pollution control, promoting the continuous development of China's social environment and industrial economy, and promoting the harmonious development of man and nature.

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