

The Realistic Significance of Green Chemistry and its Technology

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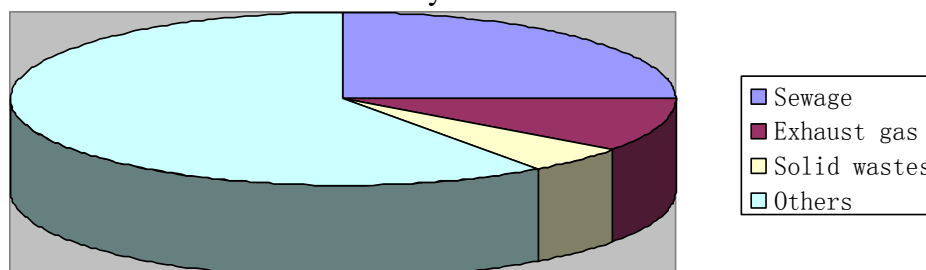
Abstract. Chemical industry provided several of chemical products for human industry and daily living, meanwhile, also caused serious environmental pollution. In order to solve environment pollution problem caused by the chemical industry production and guarantee the harmonious development of human and nature, it need promote the comprehensive, coordinated and sustainable development of human society. Green chemistry came out at the historic stage. Green chemistry is the new concept of chemistry industrial production industry. It prevents the pollution of environment from the source of chemical industrial production. In the beginning of industrial production, it need to take countermeasures of scientifically prevention of pollution, and realize the zero-discharge-pollutants for chemical industry production. Green chemistry has long-term practical significance for environmental protection and governance and resource saving.

Keywords: Green Chemistry, Industrial production, environment protection.

1. Introduction

Green chemical is also called environmentally Begin Chemistry, environmentally friendly chemistry, or clean chemistry. It makes full use of each atom to participate in the reaction of raw materials to achieve zero-discharge of chemistry in the process of chemical reaction, and with the basic principle of atom economy. Along with the advance of society and economic development, chemical industry improve the quality of human life and provide the essential chemical products. The application of chemical products is a double-edged sword, it not only improves human industry and daily living, but also hinders that improvement. A relevant data had shown that there were tens of thousands of species of chemical products in the present market. These chemical products greatly meet the needs of human material life. Chemical products has been widely applied to various fields of social life, and has an extremely important role to improve the agricultural industry and food storage, ensure the quality of agricultural production, and prevent and control the spread of disease. While, chemical products could produce harmful substances in the whole process from production to out-put, and these harmful substances serious threated human health and natural ecological environment. The data shown that industrial production had become the biggest source of pollution in environment, details as shown in table 1.

Table 1. Rate of chemical industry emissions in China industrial emission



The development of chemical industry had a serious negative influence on the fully implement the harmonious development of human and nature of the restriction of scientific outlook and high pollution, and hindered the development of chemical industry itself. In order to improve chemical

industrial production, it need to make full use of resources in the process of chemical industry production, and correctly handle the relationship between human and nature harmonious development. The application of green chemistry was the inevitable choice.

2. Green Chemistry and Environmental Protection

Since 1950s, due to the prosperity of social progress, rapid increase of population, high development of industry, increasing resources consumption and worsening environment, people must figure out a solution to sustainable development of human survival without destroy environment. Based on this ideology, the item green come out at the historic moment. Now, green is not only the symbol of a kind of color, but also the high-level expression of human pursuit of natural perfection. In green chemistry theory, human was as on ordinary member of the nature. It was a new theory with human respect to natural and harmonious relationship between human and nature. Green chemistry was different from ordinary sense of environmental protection, of which belonged to two different level of concepts. In some degree, environmental protection was with passive indication. Actually, it is in the premise of damage the environment. Then, human were forced to reflect and take action to protect. Nowadays, the discussion of environmental pollution bring harm people was still on the essential points of human-centered to deal with the relationship between human and nature. Based on this awareness, people usually governed and solved some urgent problem of pollution. But for the problems of no harm and influence on nature, people were not positive. Green chemistry was not passively control environmental pollution, but fundamentally cut off the pollution sources and initiatively prevent chemical pollution, and applied atom economy. Green chemistry was a higher level of environment friendly chemistry, clean chemistry. Its core was to use chemical principle to eliminate pollution from the source point, so the process and the terminal was zero emission and zero pollution. Green chemistry not only had the significant social, economic and environmental benefits, and also avoided adverse effects of chemical pollutions.

3. Green Chemical Technology

Green chemistry technology was the technology could reduce the harmful substances which could threaten human health and ecological environment. The goal to implemented green chemistry technology is to create a good recycling economy and society. Since the advent of green chemistry and its technology development was amazing rapid, mainly manifested in the following aspects:

3.1 To Adotp Green Material.

Green Material was the chemical raw material that could not harm human health physically and emotionally and could not threaten ecological environment. For example, traditional method was usually used to enable highly toxic phosgene to produce isocyanate; if adopt green chemical technology, carbon monoxide could be used as a raw material, directly synthesize carboxylation to isocyanates, and realize the industrialization.

3.2 To Develop Green Catalytic Process.

New type of catalyst combined biological and chemical technology enable green synthesis process for chemical synthesis in under the moderate condition or aqueous solution. For example, aluminum dichloride was widely used as a catalyst, and has the characteristics of strong corrosion, easy to hydrolysis in traditional Fiddle-Crafts acylation reaction. Each ton of acylation production could produce three tons of waste acid aluminum salt. There was a lot of harm to environment. And aluminum dichloride was replaced by non-toxic EPZG catalyst, the catalyst dosage could be 90% of previous one, and emission could be 25% of previous one.

3.3 To Produce Green Chemicals.

Green chemicals, also known as the safe chemicals. Mainly refered to chemical production with low toxicity, low residue, easy for biodegradation.

3.4 To Improve Utilization Rate of Raw Materials.

In 1991, the famous American chemist Trots, put forwarder the concept of atom economy. He supposed that green chemistry should make each atom of the raw material molecules got maximum utilization and combination to target product, in order to achieve the goal of zero discharge.

4. Profound Practical Significance of Green Chemistry Research

4.1 To Improve the Selectivity of Hydrocarbon Oxidation Reaction.

The selective oxidation of hydrocarbons in petroleum and chemical industry occupied an extremely important position. Relevant data shown that the chemical emission produced by selective oxidation of catalyst processed one quarter of the total organic chemicals. Chemical oxidation was one of the most important branch of chemistry, which had gained great progress in recent years, slough it had brought many problems. Selective oxidation of hydrocarbons was the strong exothermic reaction, and its objective product was mostly the medium compounds with thermodynamic instability. Under the reaction condition, it was easy to be further oxidized into carbon dioxide and water, and its selectivity was the lowest in all types of catalytic reaction. Chemical oxidation was also one of the technology with most serious environmental pollution, and many oxidant and catalyst contained toxic substances. This created the resources waste and environmental pollution, and brought great difficulty to the separation and purification of products, and made the cost of investment and production. To control the depth of oxidation reaction and improve the objective product selectivity was always the most challenging problems in selective oxidation of hydrocarbons research. Researchers were working to develop the green chemical technology which not only had high selectivity and high efficiency, but also was harmless to the environment.

4.2 To develop and widely apply low pollution materials.

Coal was one of the major energy in China energy structure. In the process of burning, coal was incomplete combusted, not only cause the resources wastes, but also produced large amount of sulfur dioxide and fuel dust to pollute air. At present, sulfur dioxide produced by coal combustion had reached 16 million tons, smoke and ash had exceeded more than 13 million tons. It caused a heavy burden for air quality management of China. Therefore, it was priority to seriously study and develop clean chemical technology, and strengthen the research and utilization of catalytic combustion technique, plasma sulfur removal technology and biochemistry desulphuration. This was one of the important guarantee to improve air quality.

4.3 To utilize nontoxic and harmless solvent.

In the process of chemical production, not only the raw materials and products could cause environmental pollution, but also the solvent applied, which was normally used for reaction medium, separation and formula. The most widely used solvents was Voc organic compounds with volatile features, and could cause worse pollution to environment, at the same time, and could form ground-level ozone and pollute surface water sources. So, it is a must to limit this solvent, and utilize nontoxic and harmless solvent instead of volatile organic compounds. It became an important research direction of green chemistry.

Nowadays, it was the hot spot to develop supercritical fluid research, especially the study of supercritical carbon dioxide solvent. Supercritical carbon dioxide referred to the carbon dioxide fluid with temperature and pressure above the critical point. It not only had the conventional liquid solvent solubility, and gas viscosity in the same condition with high mass transfer rate. At the same time, it also has a lot of compressibility, and the liquid density, solvent solubility and viscosity could change with the changes of pressure and temperature. Supercritical carbon dioxide had the characteristics of nontoxic, nonflammable, low cost. And the application of it was both economic and environmental protection.

4.4 To develop atom economy reaction

In recent years, it had become the hot topic in the study of green chemistry that the development of new atom economy reaction. The ideal of atom economy reaction was that the atoms of raw material molecules could 100% realize product, with zero emission. For the basic organic raw material

production, to select atomic economic reaction was very important. At present, in the basic organic raw material production, some of which had been used atomic economic reaction, such as propylene hydrogen formylation butyraldehyde, ethylene and propylene polymerization. Some basic organic raw material production was adopted one step of atom economic reaction, instead of two steps. Such as, the production of ethylene oxide. The atom economic reaction applied in industry also need further study in environmental protection and technical and economic aspects, and improve to a higher stage.

5. Conclusion

According to the concept of green chemistry and technology, it need to utilize green technology, green materials, and adhere to the principle of low toxicity, residue and easy degradation, and produce green chemical products. To implement green chemistry technology was the only method for construction of circular economy and chemical research hotspot and important scientific frontier.

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