

Research on the status quo of heavy metal pollution in soil and its remediation methods

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Abstract

The problem of heavy metal pollution in soil is becoming more and more serious, which not only affects the sustainable development of agriculture, but also threatens the survival and health of human beings. Reasonable treatment of heavy metal pollution in farmland soil has become the primary task of current social development. In order to ensure that the heavy metal pollution in farmland soil can be effectively treated, in the treatment of heavy metal pollution in farmland soil, measures should be taken according to local conditions, combined with the degree and source of pollution, and targeted selection of physical restoration technology, chemical restoration technology, agricultural ecological restoration technology, joint restoration technology and Bioremediation technology.

Keywords

Heavy metals in soil; pollution status; remediation technology; green and low-carbon.

1. Introduction

In the context of the rapid development of my country's agriculture, industry and other industries, the national economy and scientific and technological level have been effectively improved, but at the same time, a series of pollution problems have also occurred, and soil heavy metal pollution is the most representative pollution problem. Soil heavy metal pollution is not only complicated in pollution sources and harmful, but also lasts for a long time and is difficult to control. Therefore, relevant management departments should pay more attention to soil heavy metal pollution, conduct in-depth research on it, and continuously innovate and optimize remediation technology to solve the problem to the greatest extent. Heavy metal pollution in farmland, so as to achieve the strategic goal of sustainable social development in my country.

2. Status of heavy metal pollution in soil

At present, my country's soil is suffering from heavy metal pollution to varying degrees. According to statistics, the area of arable land polluted by heavy metals in my country is about 20 million hm², accounting for about 20% of the total arable land. The cumulative economic loss will be at least 20 billion yuan. From 2005 to 2013, the results of the national soil pollution survey and analysis by the Ministry of Ecology and Environment showed that the total rate of soil pollution exceeding the standard in my country was 16.1%, of which Cd, Pb, Hg, As and other soil inorganic heavy metal pollution exceeded the standard. 82.8% of the number. In addition, the environmental monitoring results of the Ministry of Agriculture show that among the 320 key pollution areas in 24 provinces (cities) in my country, the output and area of agricultural products with excessive heavy metal content account for more than 80% of the total amount and area of agricultural products with excessive pollutants.

3. Harm caused by heavy metal pollution in soil

3.1. Threat to human life and health

Soil is an important medium for the growth of crops. Heavy metals that exceed the standard in soil are absorbed by crops and accumulate in crops. After being ingested by humans through the food chain, they can cause various diseases in the human body, which in turn produces bio-amplification effects and affects human life safety and health. In the 1960s, Osteopathy caused by heavy metal Cd pollution and Minamata disease caused by heavy metal Hg pollution in Japan attracted worldwide attention. In recent years, incidents such as "cadmium rice", "excessive lead in children's blood", and "cancer villages" have been frequently reported in my country because of heavy metal pollution. In addition, studies have shown that excessive intake of Pb can cause symptoms such as developmental delay and mental decline in children; excessive Cu levels in the body can cause symptoms such as anxiety, depression and neurasthenia; a large amount of exposure to Cd can cause respiratory diseases. Excessive heavy metals seriously threaten human life and health.

3.2. Affect the normal growth and development of plants

Plants also do not have to be inevitably stressed when soils are contaminated with heavy metals. In plants grown in Pb-contaminated soil, the plant cell membrane system is attacked, resulting in the exudation of large amounts of salts and organic matter from the cells. A large number of heavy metal ions from the outside world enter the cells, affecting the normal structure and function of organelles, resulting in plant physiological and metabolic disorders. At the same time, soil heavy metal substances enter the farmland soil through various ways, and gradually accumulate in the farmland soil. When the enrichment concentration exceeds the carrying capacity of the soil, it will have a huge impact on the quality and yield of crops, thereby reducing farmers' economic profit. In addition, the properties of heavy metals are different, and the damage to crops is also different. According to relevant investigations, when the concentration of Cr²⁺ reaches 0.1 mg/L, it will seriously affect the germination of crop seeds.

4. Remediation Technology of Heavy Metal Contaminated Soil

4.1. physicochemical repair technology

Physical and chemical soil remediation technology mainly uses physical means to separate and fix through physical and chemical properties and characteristics of heavy metals, and then cooperates with chemical methods to reduce the content, effectively improving the overall treatment effect. The common method in the physical method is the soil replacement method, which is more suitable for small-area soil remediation and treatment. For example, in the local polluted soil, other non-polluted soil is filled, so that the heavy metal content in the soil can be reduced. Reduce, reduce the degree of harm in a controllable range. When the technology is implemented, it is necessary to scientifically control the thickness of the soil, and combine the characteristics of the surface pollutants to improve the performance of the new soil to meet the needs of local agricultural planting and land use. However, the shortcomings of this method are also more prominent. For example, to increase the cost input, the problem of financial consumption is more prominent, and the pollution problem of heavy metals cannot be solved from the root.

4.2. Bioremediation Technology

Bioremediation technology is one of the important means of farmland soil remediation, and it is a technical method that utilizes biological absorption, transformation and digestion of environmental pollutants. For example, rats or earthworms can enrich heavy metals in soil. According to the biological species used, it can be divided into microbial remediation

technology and phytoremediation technology. Microorganisms in soil can adsorb heavy metals, and microbial remediation technology can reduce soil heavy metal content and improve soil properties. However, microbial remediation technology also has certain limitations. For example, microorganisms have poor genetic stability and are prone to mutation, and generally cannot remove all pollutants; microorganisms have limited adsorption and accumulation capacity of heavy metals, and must compete with soil original strains, which are affected by the environment. Significantly. Phytoremediation technology reduces the mobility of heavy metals in soil and reduces the degree of heavy metal pollution in farmland soil by using heavy metal tolerant plants. Phytoremediation has the advantages of simple operation, low cost, and no damage to soil physical and chemical properties. Plants generally use their roots to accumulate and precipitate heavy metals to change the form of heavy metals, which can also benefitThe root system is used to adsorb and fix heavy metals to minimize the pollution of heavy metals to soil, surrounding farmland and groundwater. In addition, plant roots secrete some substances during the growth process, which have a positive effect on the rhizosphere environment of the soil. At present, economic plants such as jatropha, reed, reed bamboo, fiber hemp and kenaf are widely used in the remediation of heavy metal pollution in farmland soil in some areas of my country.

4.3. joint repair technology

Although a single remediation technology for heavy metal pollution in farmland soil has certain treatment effects, its development is limited by its own shortcomings. Therefore, combined remediation technology has become an inevitable choice for the treatment of heavy metal pollution in farmland soil. At present, Chinese researchers have already taken the lead in joint repair technology. Remarkable results have been achieved. First, the leaching technology is used to wash the heavy metal contaminated soil, and then the fixative (FeCl_3) is used to passivate heavy metals such as lead and zinc in the depths of the farmland; the electric field and plants are effectively combined, and their combined effect is used. When dealing with heavy metals such as cadmium, lead, and zinc in the soil, the experimental data shows that the electric field can effectively improve the absorption capacity of the corresponding plants to heavy metals, and successfully remove the heavy metals in the soil with the help of plants.

5. Epilogue

Under normal circumstances, the soil environment can slowly decompose the pollutants that enter its interior, which has a self-purification function to a certain extent. However, when the heavy metal enrichment is too much, which seriously exceeds the bearing capacity of the soil itself, the balance of the soil environment will be broken., resulting in a large amount of soil pollution, greatly

Change the nature of the soil itself, so that its function gradually disappears, soil fertility declines, and crops will also decrease in yield or even die. Crops grown in this environment will have a great impact on human health. Therefore, great attention should be paid to the problem of soil heavy metal pollution and its remediation technology.

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