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Soil Cd Pollution Characteristics and Treatment Measures

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Abstract

This paper sorts out the characteristics of soil and crop problems caused by Cd contaminated soil, and summarizes the existing engineering treatment measures, and proposes a green, pollution-free and environmentally friendly phytoremediation technology.

Keywords

Cd; Pollution; Treatment Measures; Characteristics.

1. Introduction

Cd is considered to be one of the most harmful heavy metals and is called "the top of the five poisons". Cd is a non-essential element of plants. When it accumulates in plants to a certain extent, it will show symptoms of poisoning. Macroscopic symptoms include growth retardation, short plants, chlorosis and yellowing, and reduced yield. One of the most direct and serious damage organs is Root system[1].Cd has only two valence states, zero valence and positive divalent. Because it has no other stable reduction states within the redox range of the soil, the migration and transformation of Cd in the soil is limited to the relationship between divalent Cd and its complexes. reaction. Part of the exogenous Cd is absorbed by the soil after entering the soil, and a small part remains in the soil solution. The content of Cd in the soil solution directly affects the uptake of plants. The interface migration behavior with adsorption-desorption balance as the main mechanism is to control Cd An important process of migration and transformation in the soil-plant system. Many researchers at home and abroad have conducted in-depth studies on the characteristics and influencing factors of soil adsorption-desorption of Cd.

2. Main Sources of Pollution

Different soil types show different adsorption characteristics. The bottom line is the difference in soil physical and chemical properties. The main influencing factors that affect the adsorption behavior of Cd in soil are ionic strength, temperature, pH, and soil composition. Like other heavy metals, the main sources of Cd pollution in farmland soil include: (1) Sewage irrigation. Sewage irrigation is the most important way for heavy metals to enter the soil. Mining area development, galvanizing plants, and factories related to dyes, plastic stabilizers, paint colorants, and tire production are the main sources of Cd-containing sewage. Many sewage is often introduced into farmland without any treatment. (2) Sludge application. The application of sludge and other solid waste in farmland increases the nutrient elements such as N and P, while the content of heavy metals such as Cd also increases. The soil Cd content will inevitably increase after many years of application. (3) Application of agricultural chemicals. The application of chemical fertilizers, especially phosphate fertilizers, can also cause Cd pollution. The Cd in phosphate fertilizer comes from phosphate rock. The content of Cd in phosphate fertilizer varies greatly depending on the type of phosphate rock and the processing process. (4) Pollution of atmospheric sediments. Atmospheric dust contains a certain amount of heavy

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metals, which contributes to the accumulation of heavy metals in the soil through rainfall or dry settlement[2-3].

3. Governance Measures

Research on the subject of soil heavy metal pollution prevention and control has been a research hotspot in the environmental science community for the past 30 years, and the treatment methods are constantly advancing with the rapid development of science and technology. The treatment of Cd contaminated soil is the same as other heavy metal pollution[4]. There are two main ways: first, solidification, changing the form of heavy metals in the soil, reducing their mobility and bioavailability in the environment; second, removal , Remove heavy metals from the soil. Around these two approaches, scientists have proposed many physical, chemical and biological measures. Typical examples include engineering measures, electric remediation, soil washing, chemical fixation, and phytoremediation.

4. Summary and Outlook

Phytoremediation technology, as an emerging green biotechnology, can remove pollutants from the soil through the action of plants without destroying the soil ecological environment and maintaining the soil structure and microbial activity, thereby repairing the contaminated soil[5]. According to its action process and mechanism, the phytoremediation technology of heavy metal contaminated soil can be divided into three types: 1) plant stabilization; 2) plant volatilization; 3) plant extraction. At present, the most active research is mainly plant extraction, which is also commonly referred to as phytoremediation. Phytoremediation is superior to traditional physical or chemical methods in terms of environmental friendliness and economics. It is a promising method to solve the problem of heavy metal pollution in the environment. It has become a research hotspot in the environmental field.

Although phytoremediation technology has been rapidly developed, gene technology, chelation induction technology, etc. have been applied to phytoremediation, but the problem of remediation efficiency has not been completely solved, and it is still difficult to meet the urgent needs of contaminated soil remediation. For future soil remediation work, the following issues are worth considering:

1. Adopt different disposal strategies according to the degree of soil pollution. For heavily contaminated soil, removal-oriented restoration work can be carried out, or land use methods can be changed, and edible crops cannot be planted; for large areas of moderately and lightly polluted farmland, the principle of bioavailability control can be adjusted according to the form of pollutants, consider using chemical fixation to reduce the migration and bioavailability of pollutants, and achieve the goal of crop safety.

2. Strengthen research on new technologies for remediation of contaminated soil. Facing the increasingly severe soil pollution situation, it is necessary to increase the intensity of innovation, especially the integrated research of various methods. At the same time, the basic research work of soil remediation should be further strengthened.

3. Systematically carry out research on soil remediation benchmarks and contaminated soil risk assessment system. Focusing on research on risk assessment models and assessment criteria for contaminated soil is of great significance for evaluating the feasibility and safety of remediation technologies and promoting the standardization of soil remediation.

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