Discussion on Microbial Remediation Technology of Heavy Metal Contaminated Soil

Hao Feng
ChiFeng Industry Vocational Technology College 024000

Abstract: The key issue in the world is to treat heavy metal contaminated soil. This is because environmental pollution, especially the intrusion of heavy metals in the soil, has polluted the ecological environment chain and threatened human survival. It has happened in all countries of the world. At present, through research on the source characteristics of heavy metals and the destruction behavior in soil, all countries have new research topics. This paper analyzes the soil heavy metal pollution and microbial remediation technology, and proposes how to use microbial technology to take action against heavy metal pollution in soil. The corresponding intentions of the measures with strong sexuality and effectiveness, as well as suggestions which are expected to have reference value for solving soil pollution problems.

1. Introduction

Heavy metals with a density of 4.0 or higher have been found as main elements, such as silver, zinc, nickel, cadmium, mercury and other destructive elements, which are present in soil, water and air. Its ecotoxicity and properties pose a threat to humans. With the development of technology, heavy metals in the environment can not be naturally degraded, whether in production or in life, and can not be properly disposed of, causing serious harm, which has affected human life and caused people's attention. Intrusion of a large amount of heavy metals in substances such as air, water, soil, etc., which are indispensable for animals and plants, is difficult to completely eliminate. After that, the food chain is enlarged into the human body, which is harmful to health. Even at extreme concentrations, it can be used for normal physiological activities. With the impact, it is extremely destructive. Aiming at the environmental chemistry of heavy metals in the soil, the use of prevention and control methods to completely cure heavy metal pollution is a topic that is currently being discussed in theory and practice.

2. Sources of Heavy Metal Pollution

For the analysis of heavy metal pollution sources, the production of heavy metals, such as smelting, chemical, leather, mining and other industrial production, should be analyzed. Because heavy metals are inevitably produced in industrial production, their wastes enter the soil, water and air, and carry pesticides, chemicals, fertilizer wastes, fly ash and other substances. When these materials are disposed of, they are caused by unreasonable application, environmental pollution in industrial agriculture and other aspects [1].

In industrial production, petroleum and other energy sources must release a large amount of gas and dust during the combustion process, including heavy metals such as heavy metals. In the industrial production process, it is impossible to avoid the production of toxic substances. After processing and smelting, the wastewater and waste slag finally form. The outside world forms pollution. The source of heavy metals in agricultural production mainly comes from chemical fertilizers. Due to the
irrigation of farmland by chemical fertilizer sewage and the abuse of pesticides, heavy metal pollution has occurred. Heavy metals in urban domestic waste gas are produced by automobile tires, automobile exhaust emissions, a large amount of harmful gases and dust, and a large amount of heavy metals in the middle.

Since the heavy metals contained in the soil can be heavy metals, they can react with inorganic acids to produce carbonates, etc., which are mostly transitional elements in the soil environment, and the electronic layer structure holds the chemical behavior of the valence state in a specific environment. Will produce redox. As the valence changes, toxicity and activity expand. For example, a variety of anions accumulate in the soil environment and continuously migrate to form hydroxides with less solubility in soil solutions, with humus and polysaccharides forming integrators, mixed in the soil, and finally migrated into the human body, even spread. Heavy metals tend to have environmental chemistry characteristics, and they can often change in the soil, which makes it difficult to accurately predict the migration of net heavy metals in the soil environment and increase the difficulty of pollution prevention.

The distribution of heavy metals in the soil describes the change of Cd morphology of heavy metals after 60 days of addition and non-bacteria culture. After 60 days of culture test, the distribution of Cd in different treated soils changed significantly. However, there was no significant difference in the effect of added bacteria and no added bacteria on the distribution of Cd in soil. Regardless of the addition of bacteria or not, the oxidizable state of Cd in the soil decreased, and the content of the reducible state increased slightly. The weak acid extracted heavy metal binds weakly to the soil, is most easily released, and has greater mobility; the Fe/Mn oxide bound state can be easily dissolved and released under reducing conditions; the organic matter and sulfide combined state can be The oxidation state is easily dissolved and released in an oxidizing environment; the residual state belongs to an insoluble heavy metal, and it only affects the organism by converting it into a soluble substance through a chemical reaction. Therefore, special attention should be paid to the study of high-concentration Cd and petroleum-contaminated soil to prevent secondary pollution caused by the activation of Cd [2].

The state of heavy metals in the soil can be divided into simple ion organic ions and inorganic complex ions. In terms of organically bound and changeable states, although the classification of heavy metals in the soil has been detailed, it is still impossible to analyze the corresponding standards. Therefore, there is a lack of uniform quality control standards and analytical standards, resulting in various forms of organometallics. Compound. In the process of analysis of organometallic compounds, the continuous extraction method is used to carry out three-stage four-step extraction. This method can analyze the morphological part of heavy metals in the soil, such as water-soluble state and deionized water immersion. The morphology, as well as the iron-manganese oxide binding state, are all in the form of heavy metals. The heavy metals of each form differ in physiological toxicity and chemical activity. Among them, the chemical and physiological toxicity of exchanged titanium and
water-soluble titanium is the largest, and heavy metal elements migrate and change in the soil, and physical and chemical changes of oxidation-reduction potential occur, which form complex with organic donors such as aminophosphoric acid. The substance is adsorbed by the soil colloid to become a second-order metal ion by an electron ion exchange reaction, and can react with the humus. The redox potential is a metavalent element that forms an organometallic compound in a dynamic equilibrium with the precipitation reaction. When the heavy metals in the soil change correspondingly, the solubility product constant will change in size. A certain reaction after oxygen, affecting the migration and transformation of heavy metals in the soil, including many factors, such as the coordination of heavy metals, the adsorption of heavy metals by soil colloids, the dissolution and precipitation of heavy metals in the soil, etc. [3].

3. Microbial Repair Technology

Microorganisms have the characteristics of easy cultivation and metabolism, large surface area, wide distribution, small size, fast reproduction, etc., and have outstanding characteristics in the process of material circulation and soil remediation in nature. Perform microbial repair. Heavy metal soil is technically processed. Its working principle is to reduce the toxicity of heavy metals in the soil, adsorption and accumulation, heavy metal purification, organic metal pollution, and economic value through the action of microorganisms in repairing heavy metals in contaminated soil. The microenvironment is improved to increase the probability of heavy metals being absorbed. Moreover, microbial remediation technology has lower cost, less negative soil fertility and metabolic activity, and can efficiently treat heavy metals in the soil to form an ecological restoration state. Microbial remediation, heavy metals in contaminated soil can pass through dissolution and adsorption. The heavy metal ion negative electrode is produced on the surface of the charged cell or on the surface of the internal cell, which is produced during the process of soil microorganisms utilizing the soil for effective nutrition. For example, fungi can dissolve metabolites by secreting organic acids, and when the valence state of heavy metal elements changes, activity and toxicity can be reduced. Adding an appropriate amount of sulfur partial cloud organisms to the high-concentration heavy metal sludge, resulting in the acid sulfur bacterium, can carry out sulfur oxidation, form sulfate, reduce the pH value of the sludge, and improve the mobility of heavy metals. For example, Chlorella can reduce the divalent mercury ions in organic compounds to elemental bone. By means of the secretion and activation of organic acids, the mycorrhizal fungi act in the environment of biological contact, and the organic ligands are secreted by ion exchange and remove the heavy metals.

At present, microbial remediation is widely used in domestic and foreign technologies. Heavy metal ions are dissolved by negatively charged water at the cell membrane interface, which forms microbes that are produced during growth and reproduction to repair heavy metal contaminated soil. It is widely used both at home and abroad. It not only utilizes microorganisms to decompose heavy metals in the soil, but also has a simple process and high practical value, and can form a friendly construction society in large-scale promotion. Bioremediation of heavy metal ions, for example, using conventional microbial resources, such as yeast E. coli, and the like. In the case of low concentrations in the environment, the microorganisms have good repairability, so the removal rate can reach 60%. It is currently decomposed in the soil of heavy metals in foreign countries, and is applied by degrading bacteria to produce selenite and the like for the treatment of waste liquid, and the removal rate in the solution can reach 96%. Bacterial as a biosorbent for wastewater treatment experiments, the effect is better, but microbial heavy metal repair treatment also has certain limitations. For example, due to the mutation of microorganisms, genetic stability is poor, and it is generally impossible to eradicate all pollutants.

In addition, for the adsorption of heavy metals, the ability of microorganisms to repair heavy metals in the soil, microbial remediation ability, can avoid the pollution caused by excessive use of phosphorus-containing substances, promote plant growth, and facilitate the rapid production after soil remediation. For example, experiments have shown that the analytical ability of phosphate-dissolving microorganisms is very good for the repair of heavy metals. The soil-separated strains were identified
and the phosphate-dissolving rates of degraded calcium phosphate and lecithin were 13.45% and 1.33%, respectively. From the ratio of the diameter of the transparent circle to the diameter of the static drop, the ability of the monarch's resume is judged. The analysis of the effective phosphorus absorbed by the bacteria itself reveals that the determination of the content of organic phosphorus from the culture solution cannot accurately reflect the solution of the bacteria's leave ability. The highest rate of phosphorus solubilization by the steromonas and Holder bacteria isolated from the surface soil of lead-zinc mine can reach 538.3 mg per liter. It indicates that the ability to dissolve phosphorus and the resistance to lead is very large. The use of a variety of bacterial fungi and mixed flora, physical and chemical repair means, benign combination, targeted soil organic pollution heavy metal pollution repair and so on[4].

Microorganisms are effective and economical in the treatment of soil heavy metals. Microorganisms mainly contain actinomycetes, fungi, bacteria, etc., using active microorganisms to adsorb and transform heavy metals, produce low-toxic products, and reduce the degree of heavy metal pollution. At present, microbial remediation is a technology with great application prospects. Microorganisms can secrete organic substances with the ability to complex or decompose and convert pollutants from the body, so that the mobility of pollutants is reduced or the polarity is changed. Heavy metal ions undergo dissolution and precipitation, and redox reactions occur; thus, it is not easy to enter the living body; the pollutants are decomposed and converted into non-toxic and harmless substances in vitro. This is a technology that is both economical and effective. Heavy metal repair and analysis in the soil, microbes have a charge, and have a fast metabolism. If there is a problem of heavy metal pollution in the soil, the internal microorganisms will adsorb heavy metal elements and treat the heavy metals by their own heavy metal-tolerant bacteria. The organic matter inside the soil will combine with heavy metals, that is, the microorganisms play a very good degradation between the heavy metal-organic complexes, changing the chemical properties of the ions, achieving the purpose of soil remediation and reducing heavy metal pollution [5].

After years of representative research, it is found that the complexity of microbial repair is not only related to metabolic characteristics and physiology, but also has many influencing factors, such as temperature, soil type, and water organic matter content. For example, China's experiments on microbial heavy metal pollution in the agricultural industry show that the establishment of microbial remediation of heavy metal pollution in farmland soil and the reduction of heavy metal content in agricultural products have the significance of promotion and promotion. For example, in a province that invited many scientific and technological research experts to carry out the process of remediation of heavy metals in typical soils, micro-organisms were used to comprehensively treat wastewater and waste gas in the soil. For the basic farmland, the comprehensive soil pollution remediation technology of soil deep-turning plant combined restoration and soil deep-turning microbe combined repair, through repair, makes the heavy metal content in the planted agricultural products meet the national food hygiene standards. During the repair process, the metabolic intermediates in the soil are more complex, and the microbes have a more complex impact on the heavy metal environment. The microorganisms are retained by adsorption, and the heavy metals in the soil are easily passivated [6].

4. Conclusion:
The organic matter in the microorganisms causes the heavy metals to exist in the compound contaminated soil in different forms by activating the heavy metals in the soil. The degradation efficiency of the microorganisms in the repair process is gradually increased to assist in solving the metal pollution problem. Experiments show that in the process of microbial remediation, heavy metals gradually have an effective state and morphological changes, which proves that the microbial remediation effect on the complex contaminated soil is very strong.

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