

Discussion on Engineering Remediation Technology of Groundwater and Soil Lead Contamination

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Abstract

With the continuous development of the city, the continuous expansion of industrial scale, a large number of industrial lead metal, etc., through watering and other ways into the soil and groundwater, causing soil lead pollution. In this paper, through the investigation and study of groundwater soil lead pollution problems, lead pollution remediation technology to discuss, in order to solve the practice of soil and groundwater lead pollution to provide reference.

Keywords

Lead Contamination; Soil; Groundwater; Remediation.

1. Preface

Urban development for groundwater and soil resources has caused great pressure, groundwater and soil resources in recent years by different degrees of industrial pollution, and one of the most serious heavy metal pollution is lead pollution, when people drink or eat lead-contaminated water or food, it will cause the body of lead metal is too high, affecting the intellectual development of the human body caused by the greater harm, so for the problem of lead contamination need to raise the importance of, and targeted to take corresponding technical management measures to deal with the problem of groundwater contamination. Therefore, it is necessary to pay more attention to the problem of lead contamination and take corresponding technical management measures to deal with the problem of groundwater contamination. At present, the more widely used remediation technologies, including chemical remediation, biological remediation and physical remediation methods, this paper analyzes the lead contamination, the development of corresponding measures to solve the problem, for the repair of lead contamination in groundwater and soil remediation to provide reference.

2. Lead Pollution Overview

Lead metal itself belongs to a kind of heavy metal, lead metal solid state presents greenish gray appearance, belongs to one of the toxic heavy metals. It is easy to form soot under natural conditions, causing serious pollution to the air. As an important industrial raw material, lead is widely used in the industrial field, which makes the lead metal in the form of gas, solvent, solid,

etc. in the natural environment, and infiltrated into the ecological cycle system, which has caused great damage to the ecosystem.

In the natural environment, lead metal mainly exists in the form of carbonate bound state and ferromanganese oxide, residue and exchange state, etc. In the process of lead pollution prevention and control, first of all, we should strictly control the source of lead pollution to curb the further development of lead pollution, and at the same time, formulate the corresponding remediation technology program, analyze the state of existence of lead metal and adopt the corresponding treatment method of lead pollution to carry out scientific and effective remediation, as well as strengthen the monitoring of lead contamination in groundwater and soil. Groundwater and soil lead pollution monitoring and management, improve the ecological environment and prevent lead pollution.

3. Lead Pollution Status and Hazards

3.1. Soil Lead Pollution Status and Hazards

Lead contamination of soil is a phenomenon in which the lead content in soil exceeds the permissible value of the environment due to human activities, resulting in rapid deterioration of the ecological environment and destruction of the ecosystem. With the development of the city, the continuous expansion of the industrial scale, so that a large number of lead metals gathered in the soil, damage to the original physical and chemical structure of the soil, the soil function and physical and chemical structure of the soil has a greater impact on the inhibition of microbial activities in the soil, and through the ecological cycle system and the food chain and ultimately be absorbed by the human body, endangering human health.

Soil lead metal pollution has hidden, aggregation, irreversible characteristics, and potential soil environment, it is difficult to find, but also difficult to be degraded by the natural system, with the continuation of pollution, the lead metal content continues to Fuchu, which in turn affects the crops and other plants, and through the food chain through the animals into the human body, the lead metal for the nervous system can cause greater damage to the children's intellect, and greatly inhibit the development of their brain. It can greatly affect children's intelligence and have a great inhibiting effect on their brain development.

3.2. Status and Hazards of Lead Pollution in Groundwater

Groundwater is a part of freshwater resources, is an important source of agricultural water, in some water-scarce areas groundwater is even the only source of drinking water, and the exploitation of groundwater resources makes it polluted after the impact is quite large, and at the same time, groundwater resources lack sufficient self-purification ability, groundwater pollution, it is difficult to self-recovery in the natural conditions.

China's groundwater quality problems have existed for a long time, most of the cities have different degrees of water quality problems, pollution and irrigation of farmland sewage for the groundwater caused greater damage, so that China's underground waters around the more serious contamination, and there is a tendency to spread from the city to the countryside.

Groundwater contaminated by lead, for the natural ecological environment caused by a large toxic effect, resulting in ecosystem biota reduction or even extinction, greatly disrupting the ecological balance, for agriculture, groundwater irrigation will cause a reduction in agricultural yields, and groundwater used for drinking water sources, causing chronic poisoning, the human immune system caused considerable harm.

4. Soil Lead Pollution Remediation Technology

4.1. Physical Remediation

Physical remediation method is the method of transforming soil heavy metals into harmless substances through relevant engineering treatment measures, and its main engineering means include the following engineering means

(1) Soil exchange method

Soil exchange method means digging out the polluted soil in the soil and replacing it with clean soil, through the soil exchange project, it makes the land content of lead substances decrease rapidly, while deep plowing and soil turning method is mixing the deep and shallow soil together, usually the shallow lead pollution concentration is higher, while the deep lead pollution is weaker. Therefore, deep and shallow soil mixing can effectively reduce the concentration of soil lead contamination, and generally speaking, the soil replacement method can be used for soil treatment of small-scale lead contaminated sites.

(2) Electric remediation

Electrokinetic remediation method refers to the use of heavy metal ions of the electric field effect, free lead ions or inorganic salt ions in the soil, through migration or infiltration to the direction of the electrode, in the collection of lead metal ions, after the centralized treatment. After experiments, the electric remediation method, which can effectively treat the lead metal without disturbing the site, is a convenient engineering treatment method.

4.2. Chemical Remediation

The chemical remediation method refers to the use of chemical reactions to chemically treat the nature of the soil, so as to attenuate the lead elements in the soil and reduce the concentration of lead metal, and its main treatment methods include the following methods:

(1) Elution method

The elution method refers to the effective curing of free lead ions by water or drenching agent, so that the free lead ions are separated from the soil, usually using drenching agents including EDTA, DTPA, malic acid acetic acid and so on.

(2) Curing method

Curing method refers to extracting the soil of the polluted land, injecting the corresponding chemicals into the mixture, changing the physicochemical properties of lead metal in the soil, reducing the mobility of lead metal, so as to weaken its pollutant, and now the curing method has been widely used as an important technology in the soil polluted by lead metal.

4.3. Bioremediation Method

Bioremediation method refers to the process of making full use of the biological metabolic activities in nature to consume the lead metal content and reduce the concentration of lead metal in the soil environment through harmless remediation, thus transforming the contaminated soil into the original state.

Bioremediation includes phytoremediation and microbial remediation. Phytoremediation refers to the absorption of lead metal by planting plants with enriched properties, and through repeated planting, the lead metal in the soil is continuously enriched into the plants, so that the lead metal in the soil is transferred to the plants, and after repeated planting, the concentration of lead metal is effectively reduced until it reaches the risk value below, and the original soil characteristics are restored. Microbial Remediation.

Microbial remediation refers to the full use of microorganisms for heavy metal metabolism, the use of microorganisms to reduce the concentration of lead metal in the soil, extraction, oxidation and degradation of lead metal. Microbial treatment method is less polluted, low cost,

and more widely used, but its engineering time is longer, making its application subject to certain restrictions.

5. Lead Remediation Technology for Groundwater Lead Contamination

Groundwater pollution before the remediation technology is mainly divided into physical, chemical, biological and composite treatment methods, this paper explores the more common two treatment methods are as follows:

5.1. Extraction Treatment Method

Extraction treatment method is the application of more groundwater lead contamination treatment methods, the technology has a wide range of applications, its main treatment is, first of all, the investigation of the scope of lightly contaminated water bodies, set up extraction wells within the scope of the contamination, through the extraction wells will be contaminated groundwater extracted to the surface, and by the wastewater treatment measures, the lead elements in the groundwater treatment, the treated water body can be discharged on the surface, or sent back to the original The water body can be discharged to the surface after treatment or sent back to the original water body. The pumping out technology is simple to operate, so it is more widely applied to lead-contaminated areas.

5.2. Osmotic Reaction Screen Remediation

Permeable reaction screen method is also one of the remediation techniques for groundwater contaminated by lead, and its main operation step is to investigate the flow direction of the lead-contaminated water body, and set up a reaction screen in the groundwater area, so that the lead substance in the groundwater passes through the reaction screen, and within the reaction screen, the lead substance is stagnated within the reaction barrier by precipitation, adsorption, oxidization, reduction, degradation, and other physical and chemical reactions, so as to avoid the further diffusion of the lead element, and it is also a good solution to the problem of lead contamination in groundwater. As the reaction screen engineering measures are simple, the installation and operation can be completed at the same time, no extra effort is needed to maintain it after the operation of the remediation project, and the remediation efficiency is high, thus it has been widely used.

6. Conclusion

In the remediation of lead contamination in groundwater and soil, chemical, biological and physical remediation methods should be comprehensively utilized to effectively prevent and control lead contamination in groundwater and soil, and in the specific engineering measures, appropriate technical methods should be selected according to the degree of contamination and hazards as well as local economic and technological conditions, so as to promote effective remediation of the contaminated groundwater and soil.

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