

# Research on Remediation Methods of Soil Arsenic Pollution

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## Abstract

**The pollution of heavy metal arsenic has begun to endanger people's health, so research on how to reduce and repair the problem of soil arsenic pollution has become more and more urgent. Arsenic contaminates a large area. Traditional techniques are used to treat and repair heavy metal arsenic contaminated soil. The price is high, the operation is difficult, and the effect is unsatisfactory. Therefore, the application of high efficiency, environmental protection and low price have become research hotspots. This article briefly describes several remediation methods for soil arsenic pollution, and provides an efficient, safe and stable theoretical system for soil heavy metal arsenic pollution remediation technology.**

## Keywords

**Heavy metal pollution; soil remediation; arsenic pollution; farmland protection.**

## 1. Introduction

As my country's economic development has entered the track of high-speed trains, the population has exploded, and the process of industrialization has accelerated as never before. The plunder and waste of resources by humans has reached an unprecedented level. Behind the economic prosperity is the increasing shortage of resources and the continuous ecological environment. Deterioration brings serious challenges to human survival. The pollution of heavy metal soil has become more and more prominent, because heavy metal pollution of the soil far exceeds the self-regulation ability of the soil, which makes the soil heavy metal pollution more and more serious. Therefore, soil heavy metal pollution has become a hot topic in soil science research in China, and it is of great significance for my country to solve food production and safety.

## 2. Current status of arsenic pollution

So far, the total amount of arsenic has been proven to analyze, my country is a country with large arsenic reserves, and the total amount of arsenic accounts for about 70% of the total arsenic in the world. Due to the historically irregular, unreasonable and unscientific mining of minerals, arsenic pollution of soil and water bodies usually occurs near arsenic mining areas in my country. The most serious heavy metal arsenic pollution in China is in the southwestern region. Arsenic in nature hardly exists alone, most of which are always in the form of sulfides ( $As_4S_4$ ,  $As_2S_3$ ,  $FeAsS$ ) or compounds with slag contained in other metals. According to investigations, the proportion of symbiotic and associated arsenic minerals in my country is as high as 87.1%. As my country's metal smelting technology is relatively backward, the arsenic mined every year is brought out by other minerals and cannot be processed and utilized in a timely and effective manner. The heavy metal arsenic is activated after being exposed to the ground through perennial weathering and leaching, and the heavy metal arsenic diffuses into the surrounding environment. , Leading to the expansion and aggravation of soil pollution.

### 3. Soil arsenic pollution remediation method

#### 3.1. Stable curing method

Analyze the pollution degree of the pollutants to be treated first, then mix the targeted treatment agent, mix the soil contaminated by arsenic with the well-proportioned agent 10~30%, add the mixed water and stir in the mixer for 3~5 minutes. It is used for 3~5 days after discharge. This can effectively wrap heavy metals in the crystals. So as to achieve the problem of treatment of heavy metal pollution, the treatment efficiency is in accordance with the required standards. Characteristics and application of solidification-stabilization technology: This technology is to fix the pollutants in the polluted medium to make it in a long-term stable state. The immobilization technology is to encapsulate the pollutants in an inert substrate, or add a low Permeable materials achieve the purpose of limiting the migration of pollutants by reducing the leaching area exposed by the pollutants; stabilization refers to the effectiveness of the pollutants, through the transformation of the form, the pollutants are transformed into insoluble, migratory or more toxic. To achieve harmlessness in a small form to reduce the risk of harm to the ecosystem. It is a more commonly used method of rapid control and remediation of heavy metal pollution in soil, and has obvious advantages in the simultaneous treatment of multiple heavy metal contaminated soils.

Advantages of stable curing method: low price, convenient curing agent, simple operation, etc. It is solid after stable curing, so it is easy to carry. The stable solidification method generally does not change some of the physical properties of the soil, so it can improve economics and benefits. Disadvantages: Incomplete handling.

#### 3.2. Engineering Measures Act

The deep ploughing method, soil replacement method and foreign soil method are currently three common soil types of heavy metal engineering measures to repair methods. When heavy metal pollutants accumulate on the surface of the soil, deep ploughing is used to turn heavy metal pollutants into the depths to disperse and dilute it, which is called deep ploughing. The removal of soil contaminated by heavy metals and the removal of soil that is good and in line with the local ecological environment is called the soil replacement method. Adding heavy metal contaminated soil to clean soil, the soil is diluted to a level of heavy metal content lower than the national standard, which is called the foreign soil method.

Advantages of engineering measures: the repaired soil has good stability and thoroughness. Disadvantages: the cost is too high, the amount of work is huge, the soil structure is damaged and it is difficult to recover, resulting in the decline of soil fertility.

#### 3.3. Physicochemical repair method

Physical and chemical restoration mainly includes soil leaching method, vitrification method, electrochemical method, etc. The soil leaching method uses a leaching agent to rinse the contaminated soil, so that heavy metals in the solid phase of the soil are transferred to the liquid phase of the soil, and the toxicity of the pollutant is reduced. The vitrification method uses electric heating on site to melt the contaminated soil and form a chemically inert, non-diffusion hard glass body after cooling. The electrochemical method uses the electrokinetic effect generated by an external electric field to drive the pollutants in the soil to migrate in the direction of the electric field. Enriched pollutants can be concentrated or separated in the electrode area. Arsenic in clayey soils with low permeability and poor conductivity can be removed by electrochemical methods based on the principle that electric current can destroy the metal-soil bond. Physical restoration technology: saving money, high yield, sustainable... Characteristics and application of physical separation and remediation: Physical separation technology is mainly used in the remediation of inorganic pollutants in contaminated soil. It is

most suitable for treating soil contaminated by shooting ranges in a small area, separating heavy metals from soil, sediments, and waste residues, cleaning the soil, and restoring the normal functions of the soil. Most physical separation repair technologies have the advantages of simple equipment, low cost, sustainable high output, etc. However, in the specific separation process, the feasibility of the technology must be affected by various factors. Chemical remediation technology: diverse methods, strong applicability, prevention of secondary pollution is the key chemical leaching remediation technology characteristics and applications: soil leaching remediation technology is to use water or an aqueous solution containing flushing additives, acid P alkali solution, complexing agent Or surfactants and other eluents are injected into contaminated soil or sediment to wash out and clean the pollutants in the soil. After the leaching wastewater is treated, it is discharged up to the standard, and the treated soil can be reused safely. Suitable for heavy metal pollution or mixed pollution media with multiple pollutants.

Its advantages are: strong applicability. At present, this kind of off-site repair technology has been engineered and applied in many countries. The disadvantage is that water is needed, so the repair site requires close to the water source, and at the same time, the cost of wastewater treatment is increased. It is suitable for the restoration of soil and groundwater contaminated by organic matter at the same time. Use chemical reduction methods to repair organic pollutants that are sensitive to reduction. The advantage is that the technology can be used to clean up the pollution source area relatively quickly, which usually takes 3 to 24 months. The technical disadvantage is that the application of zero-valent iron reduction dechlorination and degradation of chlorine-containing organic compounds technology also has problems such as passivation of iron surface activity and polymerization failure due to adsorption by soil.

#### 4. Conclusion

The pollution of metal arsenic to the soil and the commonly used treatment technologies, for the pollution and treatment of heavy metals to the soil, the stable solidification method is highly representative and practical. It is a method that has received more attention at present.

The action mechanism of the stable curing method is to imitate the formation process of metal ore, so that the heavy metal particles are fixed by the stabilizer under the action of natural rock intermediate adsorption, reaction adsorption, ion exchange, etc., and further through the water content of silicic acid, arsenic, etc. The high degree of crystallization of amorphous substances and low-crystalline minerals makes heavy metals become trace components in minerals. The resulting crystalline substance can generate interlaced crystals through the recrystallization process and between particles to form a strong structure solidified network, and the solidified heavy metals are further sealed in the solidified network. This process not only achieves the effect of solidification, but also achieves the effect of stabilization through the irreversible reaction process of crystal interlacing and recrystallization. The formed solidified substance can also inhibit the re-dissolution and diffusion of pollutants under the change of environmental conditions. In general, there are many ways to solve the problem of arsenic exceeding the standard. Arsenic pollution control should follow the following principles; first consider the zero treatment strategy, and adopt the method of intermittent start and stop or mixing ratio to reduce the arsenic content in the water and solve the problem of arsenic exceeding the standard. And should focus on the optimization and improvement of existing equipment. Develop a new process for arsenic removal. Through the development of new processes, the pollution of arsenic to the environment is reduced, and the recovery rate of valuable metals in arsenic minerals is improved. Therefore, we must intensify research and treatment of the problem of arsenic exceeding the standard.

## References

- [1] Wei Lianghong, Zhou Wenqin. Development of arsenic mineral resources and environment control [J]. hunan geology, 1992, (3): 259-262.
- [2] Xiao Xiyuan, Chen Tongbin, Liao Xiaoyong, et al. Regional distribution of arsenic contained minerals and arsenic pollution in China[J]. Geographical Research,2008, 27(1): 201-212.
- [3] Qian Chaohai, Xu Yunsheng, Tu Shiyong. Talking about the harm of arsenic pollution and the correct use of arsenic preparations[J]. Yunnan Journal Of Animal Science And Veterinary Medicine, 2010(1):41-42.
- [4] Shi Zhenhuan, Mo Jia, Mo Binji, et al. Arsenic pollution and its research significance in non-ferrous metal mine tailings[J]. Nonferrous Metals(Mine Section), 2015, 67(2):58-62.