

# Research on Bioremediation Technology of Soil Heavy Metal Arsenic Pollution

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## Abstract

**With the acceleration of industrialization in recent years, arsenic has been widely used in agricultural production, resulting in a sharp increase in the content of heavy metal arsenic in the soil, and accumulated in agricultural production, leading to unsafe and polluting many agricultural products. This article compares and analyzes the advantages and disadvantages of bioremediation technology in soil heavy metal arsenic pollution remediation species, hoping to provide some ideas for soil arsenic pollution remediation technology.**

## Keywords

**Arsenic (As); Heavy Metal Pollution; Bioremediation Technology; Hazard; Repair Technology.**

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## 1. Introduction

Arsenic (As) is a heavy metal element that is widely distributed in nature. Arsenic always exists in the form of compounds in nature, and arsenic compounds are generally harmful to the environment, and endanger the natural environment and ecology on which humans depend. environment. [3] Heavy metal arsenic pollution generally spreads, resulting in an increase in the area of heavy metal arsenic pollution, which has deeply endangered human health. The heavy metal arsenic has been recognized as a category A carcinogen by international authorities such as the World Health Organization (WHO), the International Association for Cancer Research (IARC) and the US Centers for Disease Control [4]. The heavy metal arsenic contaminated soil and its remediation have attracted more and more attention.

People who have been exposed to heavy metal arsenic for a long time can cause cancer, skin diseases, and deformities. It is reported that in the ecological environment where humans live, animals or humans are often exposed to trace or excessive heavy metal arsenic in the environment and are more likely to suffer from cancer and other diseases. With the mining of a large number of metal mines in recent years, people's living land has become more and more polluted by heavy metal arsenic. After mining, a large amount of heavy metal slag and arsenic are left on the surface. The slag is also brought out along with the oxygen in the air. Oxidation, rain washing, and heavy metal arsenic are activated, which leads to increased soil arsenic pollution. Therefore, the problem of arsenic exposure to surface contaminated soil has attracted more and more attention. The treatment and restoration of arsenic-contaminated surface soil is urgent for today's society. Some undeveloped countries and countries such as China have experienced serious soil pollution by heavy metal arsenic.

## 2. Current status of soil heavy metal arsenic pollution

With the acceleration of industrialization in recent years, arsenic has been widely used in agricultural production, resulting in a sharp increase in the content of heavy metal arsenic in the soil, and accumulated in agricultural production, leading to unsafe and polluting many agricultural products.

As the heavy metal arsenic is mined in large quantities, a large number of heavy metal arsenic-containing rocks are accumulated, and heavy metal arsenic is leached and dissolved in the soil by rainwater. Oxygen in the air contains heavy metal arsenic tailings, which leads to heavy metal arsenic elements. Dissolution, oxidation, transfer and diffusion lead to heavy metal arsenic polluting the soil, destroying the natural environment that humans rely on for survival, and seriously endangering people's health. As my country's soil arsenic pollution incidents are showing a trend of concentrated outbreaks, there are endless soil arsenic pollution incidents in Dushan County of Guizhou Province, Chenxi County of Hunan Province, Hechi City of Guangxi Province, Yangzonghai Area of Yunnan Province, Dashahe Area of Henan Province, and Pi Cang Floodway Area All these indicate that soil arsenic pollution has developed into a disaster.

According to statistics, my country's annual output of arsenic slag is 500,000 tons, and the accumulated arsenic slag is 2 million tons. However, the harmless treatment and comprehensive utilization of arsenic slag are low. The idle and arbitrary stacking of a large number of arsenic-containing tailings have accelerated the release of arsenic to The speed in the soil, so in areas where mining and smelting activities are intensive, the problem of soil arsenic pollution is particularly prominent. The concentration of arsenic in the tailings of the Hatu gold mine in Karamay, Xinjiang is as high as 1100 mg/kg, and the concentration of arsenic in the tailings of the Axi gold mine in Ili Kazakh Autonomous Prefecture is above 1000 mg/kg, posing a serious threat to the local soil and groundwater. The arsenic smelting site at Tieshiping, Zhaigang Town, Lianna County, Guangdong Province, after the production was stopped in the late 1980s, 21.47 million tons of waste residue and tailings containing 2.14% to 5.18% arsenic were piled, covering an area of 1128hm<sup>2</sup>. There are at least thousands of km<sup>2</sup> of soil contaminated by arsenic in Guangxi and Hunan provinces. The arsenic pollution in agricultural soil near the mining area, smelting area and tailings area of the Xikuangshan antimony mining area in Hunan was studied. The results showed that the concentration of arsenic in the agricultural soil at 8 sampling points in these 3 areas was 14.95~363.19mg/kg, which was much higher. The background value of arsenic in Hunan soil.

### **3. Application of Bioremediation Technology for Soil Arsenic Pollution**

Bioremediation technology mainly includes phytoremediation and animal remediation. Phytoremediation is generally considered to be a plant that can absorb, purify, and remove heavy metals or pollutants from the soil. The phytoremediation and mechanism of soil arsenic pollution are divided into: cumulative absorption of arsenic by plants, volatilization of arsenic by plants, transformation of arsenic valence by plants, and expression of arsenic by transgenic plants so that arsenic can be transmitted to other parts of the plant to achieve the effect of arsenic on soil. Governance.

Phytoremediation is generally applicable to soils with a wide range of soil pollution and contaminated soils that can allow plants to survive. Phytoremediation is the use of plants to accumulate heavy metals to achieve the repair and degradation effects, and the use of plants to convert heavy metals into organic metals to reduce their boiling point. It has the characteristics of volatilization, the use of plant root exudates to reduce the toxicity of heavy metals, and the use of plants to transfer heavy metals to other fixed parts of the plant for centralized treatment.

Technical advantages of phytoremediation: Not only does the treatment of heavy metals have no secondary pollution, but the remediation technology is simple, easy to accept, and low in cost and cost; phytoremediation technology can be used to beautify the environment, construct wetland, improve soil, protect the environment, and control Soil deterioration also purifies the air; while reducing soil pollution of heavy metals, it can also improve its ecological environment and recycle heavy metals to achieve better economic benefits. Disadvantages: Although phytoremediation has made corresponding achievements in my country, its theoretical system is incomplete, lacks theoretical support, and research on farmland and radioactive elements is rare. The treatment time is

long, and the later centralized processing and collection of plants are labor-intensive, and the process technology requirements are high.

According to research, some lower animals such as voles and earthworms can repair and degrade soil contaminated with heavy metal arsenic. For example, the study of various parts of voles found that the liver of voles has a high content of heavy metal arsenic. Earthworms can improve the soil at the same time. Concentration of arsenic. Introduce voles and earthworms to the arsenic-contaminated fields. After the voles and earthworms are enriched with arsenic, centralized treatment is adopted.

Advantages of soil animal remediation method: loosen the soil and improve soil fertility. Disadvantages: The treatment process is complicated, the cost is high, and it cannot be handled thoroughly.

#### 4. Conclusion

As the heavy metal arsenic is mined in large quantities, a large number of heavy metal arsenic-containing rocks are accumulated, and heavy metal arsenic is leached and dissolved in the soil by rainwater. Oxygen in the air contains heavy metal arsenic tailings, which leads to heavy metal arsenic elements. Dissolution, oxidation, transfer and diffusion lead to heavy metal arsenic polluting the soil, destroying the natural environment that humans rely on for survival, and seriously endangering people's health. This article compares and analyzes the advantages and disadvantages of bioremediation technology in soil heavy metal arsenic pollution remediation species, hoping to provide some ideas for soil arsenic pollution remediation technology.

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