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# Use of brown coal as a detoxifier of soils contaminated with heavy metals

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**Abstract**

The main objective of the work was to study the applicability of brown coal as a sorbing and detoxifying agent of soils contaminated with heavy metals. Both laboratory experiments and field small-plot experiments on an urbanozem contaminated with lead and zinc have been conducted. Brown coal from the Aleksandria deposit (Ukraine) has been used as a sorbent. It has been shown that brown coal has an increased capacity to sorb heavy metals due to the large specific surface area and the presence of functional groups capable of ensuring the chemosorption of contaminant cations. However, the degree of adsorption by brown coal varies among the cations. Brown coal can be recommended as an ameliorant for soils contaminated with lead, zinc, and copper. It is important to correctly calculate the application rate of the ameliorant. An empirical formula was proposed for the calculation of the ameliorant rate, which can be used for the most cost-efficient detoxification method of soils contaminated with lead, zinc, and copper.

**Key words:** ameliorants, brown coal, detoxification, heavy metals, soil pollution, soil protection, sorption capacity

## 1.1. Introduction

Studies on the detoxification of soils locally contaminated with heavy metals (HMs) are of great current interest. The HM content in the topsoil exceeding the maximum permissible concentration (MPC) by tens of times can be reached in the buffer zones of motor and rail roads, mines, and industrial enterprises. HMs get with industrial waste into the sewerage system and then into the soil (Nehls et al., 2008). The wide range of HMs in waste water is typical not only for traditional dirty works (e.g., galvanic shops), where these elements are used in the technological cycle, but also for food and light industries.

The total amount of soluble metals (primarily nickel, chromium, zinc, and copper) removed with waste water and emissions from industrial factories are

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