

Immobilization of hazardous anions in andosol and alluvial soil using magnesium oxide

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Soil contamination by hazardous anions is a significant problem in Japan. Magnesium oxide (MgO) has been used as an immobilization agent for hazardous anions such as fluoride and boron. However, it is difficult to optimize the immobilization process because the immobilization depends on the type of soil and the long-term elution behavior of hazardous substances is uncertain.

In this study, to investigate whether MgO can be applied to immobilize fluoride and boron in andosol and alluvial soil and to clarify the immobilization mechanism, the following experiments were conducted; 1) characterization of different types of soil (andosol, alluvial soil), 2) MgO hydration rate determination, 3) interactions between soils and MgO, 4) fluoride and boron sorption behavior onto MgO, 5) immobilization experiments using the soils under several pH and anion loading.

The possible mechanisms of immobilization of fluoride and boron in andosol and alluvial soil using MgO are as follows. Fluoride is immobilized via incorporation into the magnesium hydroxide (Mg(OH)₂) structure during the MgO hydration reaction. On the other hand, boron is immobilized by coprecipitation with magnesium following the formation of a magnesium borate complex. To summarize, proposals for carrying out immobilization were made. To immobilize the anions, MgO should be added into the soils to establish the above mechanisms. One significant point is that MgO addition should take the pH buffering capacity of soils into account.

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