Characterization of Long-Term Leaching Properties of Lead from Naturally Contaminated Soils

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Recent amendment of the Soil Contamination Countermeasures Act in Japan requires countermeasures to the soils including naturally occurring heavy metals, i.e., the soils even if they are naturally contaminated. Among a variety of toxic heavy metals, Lead remains a top priority for study, because it is one of the most common contaminants not only in Japan, but worldwide.

To characterize the long-term leaching properties of lead from naturally contaminated soils, six samples taken from the surroundings of different, abandoned metal mines were collected and tested. Chemical compositions, mineral compositions, cation exchange capacity, total organic carbon, total and leaching concentrations, existing form and sequential leaching concentrations of lead were systematically analyzed and examined.

The results of this study demonstrated that 1) X-ray fluorescence analysis cannot obtain comparative value of total concentration of lead for naturally contaminated soils compared with the standard test method based on acid extraction. 2) Leaching concentration does not depend on total concentration. Soil samples containing low total concentrations that are below environmental standard may have high leaching concentrations. 3) Leaching concentration is not stable during sequential and/or long-term leaching. Leaching concentration that meets environmental standard at a time may fail to meet environmental standard someday even under similar pH conditions. 4) Leaching properties of lead from naturally contaminated soils are fundamentally controlled by its existing form. 5) Compared with removing toxic heavy metals, immobilization and/or solidification together with risk-based management of naturally contaminated soils could be more cost-effective and practical.

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