

Sequential water leaching method to assess geogenic arsenic contamination in construction surplus urban soils in Japan

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Urban construction projects require excavation of large amounts of soil from deep ground. In most cases, excavated soils have not been affected by human activities and As is from geogenic sources with its content extremely low. However, the construction surplus urban soils have now become of great concern in Japan because the As water-leaching concentrations are usually higher than the Japanese environmental standard (10 $\mu\text{g/L}$). After excavation, the landowners should therefore take necessary measures to mitigate the As release from these soils. Our study mainly assessed the continuous water-leaching behaviors of As in excavated urban soils in Japan. Sequential leaching tests (SLT) were conducted, in which the excavated soils were repeatedly washed using deionized water. The studied soils were alkaline (pH 8~10) and contained low geogenic As (<11 mg/kg). We found that the As leaching from these soils could last for a long period. In a case study, it even required more than 70 times of water extraction until the As in the leachate was below its ICP-MS detection limit (0.05 $\mu\text{g/L}$). To quickly estimate the potential water-leachability of As from excavated soils, a new concept, the pollution potential leaching index (PPLI) was proposed. PPLI can be estimated using SLT results. The PPLI value is a cumulative L/S ratio (L/kg) when the average As concentration (the ratio of cumulative released As (mg/kg) to cumulative L/S value (L/kg)) in the cumulative leachate equals to the Japanese standard value (10 $\mu\text{g/L}$). A higher PPLI value indicates a higher pollution threat. PPLI was also preliminarily standardized based on the SLTs results under different test parameters, and a good reproducibility of PPLI result was obtained. Although the PPLI information does not completely represent field-scale conditions, it can be a useful tool for evaluation of the quality of excavated soils, by which the As pollution potential from excavated soils in society can be assessed on a broad scale.