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Removal of arsenic from Janghang smelter site and energy crops-grown soil with soil washing using magnetic iron oxide

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Arsenic compounds are considered carcinogen and easily enter drinking water supplies with their natural abundance. US Environmental Protection Agency is finalizing a regulation to reduce the public health risks from arsenic in drinking water by revising the current drinking water standard for arsenic from 50 ppb to 10 ppb in 2001 (USEPA, 2001). Therefore, soil remediation is also growing field to prevent contamination of groundwater as well as crop cultivation.

Soil washing is adjusted as ex-situ soil remediation technique which reduces volume of the contaminated soil. The technique is composed of physical separation and chemical extraction to extract target metal contamination in the soil. Chemical extraction methods have been developed solubilizing contaminants containing reagents such as acids or chelating agents. And acid extraction is proven as the most commonly used technology to treat heavy metals in soil, sediment, and sludge (FRTR, 2007).

Due to the unique physical and chemical properties, magnetic iron oxide have been used in diverse areas including information technology and biomedicine. Magnetic iron oxides also can be used as adsorbent to heavy metal enhancing removal efficiency of arsenic concentration. In this study, magnetite is used as the washing agent with acid extraction condition so that the injected oxide can be separated by magnetic field.

Soil samples were collected from three separate areas in the Janghang smelter site and energy crops-grown soil to have synergy effect with phytoremediation. Each sample was air-dried and sieved (2mm). Soil washing condition was adjusted on pH in the range of 0-12 with hydrogen chloride and sodium hydroxide. After performing soil washing procedure, arsenic-extracted samples were analyzed for arsenic concentration by inductively coupled plasma optical emission spectrometer (ICP-OES). All the soils have exceeded worrisome level of soil contamination for region 1 (25mg/kg) so the soil remediation techniques are needed to be applied.

The objective of this study is to investigate soil washing efficiency using magnetic iron oxide and derive the availability of the washing technique to the arsenic-contaminated field soils.

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