282e Managing Arsenic Contaminated Soil, Sediment, and Industrial Waste with Solidification/Stabilization Treatment

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Arsenic contamination of soil, sediment and groundwater is a widespread problem in certain areas and has caused great public concern due to increased awareness of the health risks. Often the contamination is naturally occurring, but it can also be a result of waste generated from industrial processes. In recent times, the maximum contaminant level (MCL) for arsenic has been reduced by the U.S. EPA, resulting in development of better treatment methods to achieve the required standards for drinking water. Arsenic contaminated hazardous wastes are subject to land disposal restrictions under Resource Conservation and Recovery Act (RCRA) and must be treated to meet toxicity characteristic leaching procedure (TCLP) limits.

The present study focuses on two types of solidification/stabilization technologies to contain the long term leaching potential of arsenic after disposal. Three types of arsenic contaminated materials were selected: a) Montana soil spiked with monosodium acid methanearsonate, b) composite sample from La Trinidad (California) mine tailings sediment deposits, and c) chromated-copper-arsenate (CCA) wood treater waste or door-pit residue from Osmose, Inc. These three samples were treated with two technologies: TerraBond®, a commercially available technology; and Portland cement with addition of ferrous sulfate and lime (PFL). The treatment procedure followed for the second method was obtained from available peer-reviewed literature search. Characterizations of sample materials were conducted by analyzing the particle size, moisture content, and conducting XRD and SEM analyses. The leachability of untreated and treated samples was evaluated by conducting a) variable pH-based leach test, b) TCLP test, and c) semi-dynamic leach test. Extended X-ray absorption fine structure (EXAFS) spectroscopic analysis was conducted to identify the differences of As coordination between samples before and after treatment process. Sequential extraction test was also conducted to obtain a quantifiable idea of the amount of arsenic present in different phases.

The results obtained from these studies give insightful details about the leachability and mobility of arsenic in the sample. Though both treatment methods reduced the arsenic mobility, the effectiveness of these treatments varied significantly for different types of contaminated matrix. TerraBond is a process involving physical encapsulation and hydrocarbon coating, while immobilization of arsenic by cement and lime is due to the formation of calcium arsenic minerals. Sequential extraction results indicate that the chemical nature of the arsenic in the contaminated matrix governs the leachability.