An Introduction to Metals Stabilization for Site Remediation

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Resumo

A estabilização de metais no solo e águas subterrâneas pode ser um componente integral da remediação . Tecnologias de estabilização pode ser aplicado para minimizar os custos de eliminação de ex-situ solo ou de resíduos, que podem ser reutilizados no local com a administração in-situ de solo tratado. Esta apresentação irá focar em tecnologias que quimicamente estabilizar metais, reduzindo a lixiviabilidade dos metais em uma variedade de configurações. A apresentação começará com uma discussão sobre a abordagem geral para projetos de estabilização bem-sucedidos e, em seguida, analisar os vários métodos que estão disponíveis para a avaliação do desempenho de estabilização. Será apresentada uma série de aplicações e vários reagentes de estabilização que satisfaçam as condições específicas em cada local. A apresentação será concluída com histórias de casos de metais projetos de estabilização de áreas contaminadas com metais diversos.

Abstract

Stabilization of metals in soil and groundwater can be an integral component of site remediation. Stabilization technologies can be applied to minimize disposal costs of ex-situ soil or waste, which can be reused on-site with in-situ management of the treated soil. This presentation will focus on technologies that chemically stabilize metals, reducing the leachability of the metals in a variety of settings. The presentation will begin with a discussion of the general approach to successful stabilization projects, and then review the various methods that are available for the evaluation of stabilization performance. A number of applications and multiple stabilization reagents will be presented that satisfy specific conditions at each site. The presentation will conclude with case histories of metals stabilization projects for sites contaminated with various metals.

Key Words

Metals, Stabilization, Remediation, Soil, Groundwater

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1-INTRODUCTION

Stabilization of heavy metals provides a cost-effective alternative for remediation of soil and groundwater. Stabilization can be implemented to achieve remediation goals for off-site disposal and for on-site reuse of stabilized material. Commercially available reagents from local sources can be evaluated to determine the best-performing solution to achieve the required reduction in leachable metals concentrations. Once a chemistry is selected, reagents are typically applied by injection methods or mechanical mixing using conventional construction equipment.

2-REMEDIATION GOALS

Determining appropriate remediation goals is a critical step to evaluate a stabilization approach for metals remediation. The test methods and remediation goals should represent the intended end-uses of the stabilized materials. If stabilized material is disposed off-site at a landfill, the leaching test and remediation goals should represent the leaching potential in a landfill setting, and the exposure risks from the leachate. For *in situ* applications, leaching tests are often designed to mimic infiltration from rain and contact with site groundwater. Remediation goals for *in situ* applications should also consider exposure risks based on the site setting.

3-STABILIZATION TO MEET GOALS

Selection of stabilization chemistries is dependent on remediation goals. The stabilization chemistries may be different based on the intended disposal setting or reuse of stabilized materials. In general, stabilization of metals includes the addition of reagents to form insoluble minerals that are stable in the intended disposal or reuse setting. Commercially available bulk chemicals or proprietary products commonly use iron, phosphate, sulfur, organic material, and alkaline hydroxides, oxides or carbonates to form these minerals. Reagents can be applied in dry, granular form for mixing *in situ* or *ex situ*. Reagents can also be applied and mechanically mixed or injected as a solution or slurry to stabilize metals in subsurface soil and groundwater.

4-CASE STUDIES

Case studies will be presented to demonstrate the performance of stabilization chemistries for metals in various *in situ* and *ex situ* applications. The case studies will

primarily address arsenic, cadmium, chromium, lead, mercury, and selenium with respect to landfill disposal, unsaturated soil reuse and saturated soil/groundwater settings.