Geophysical Research Abstracts, Vol. 8, 09424, 2006
SRef-ID: 1607-7962/gra/EGU06-A-09424

Application of Deep Soil Mixing techniques for in-situ reductive treatment of Chromite Ore Processing Residue

D. Dermatas (1), **M. Chrysochoou** (1)

(1) W.M. Keck Geoenvironmental Laboratory, Stevens Institute of Technology, U.S.A. (mchrysoc@stevens.edu, +12012168773)

Chromite Ore Processing Residue (COPR) is the by-product of chromite ore processing to isolate and extract chromium. The environmental hazard posed by the high concentration of hexavalent chromium in COPR, as well as the pronounced heaving phenomena observed in COPR, led to extensive investigation of COPR deposition sites at Study Area 7 (SA7), a COPR deposition site in Hudson County, NJ. Bench-scale studies on SA7 COPR showed that ferrous sulfate (FeSO4) could be an effective reducing agent. However, the delivery of the reductant on a larger scale posed an significant problem for large-scale application, as previous studies has shown that injection and poor dissemination of the reductant led to treatment failure. Two types of Deep Soil Mixing techniques were employed as an alternative in the SA7 pilot testing program, a Horizontal Rotary Mixer (HRM) and a Vertical Auger (VA). The SA7 pilot study showed that the type of mixing equipment played a crucial role both for the chemical reactions, as well as for the geotechnical properties of the treated material. The intensive mixing of the reductant in dry form in proximity to the atmosphere in the HRM favored competing oxidation of ferrous by oxygen and quickly led to treatment failure. Conversely, the VA delivered the reductant in a slurry form to deeper layers, minimizing the exposure to atmospheric air due to saturated conditions and limited surface area, producing more favorable conditions for the redox reaction between ferrous and Cr(VI). Treatment yielded satisfactory results after 120 days of curing; however, continuous monitoring is warranted to ensure permanence of treatment. Overall, the SA7 pilot scale study showed that the choice of delivery method is crucial in the design and implementation of an in-situ of a reductive treatment and should be carefully considered in large scale applications.