Basim A. Hussain  
Environmental Engineering,  
Ministry of Science and  
Technology Directorate of  
Hazardous Wastes Treatment and  
Disposal, Baghdad, Iraq  
basimsaidi@hotmail.com

Shahlaa E. Ebrahim  
Environmental Engineering  
University of Baghdad,  
Environmental Engineer  
Department, Baghdad, Iraq  
shahlaa.ebrahim@fulbrightmail.org

Abbas H. Sulaymon  
Chemical Engineering, University  
of Baghdad, Environmental  
Engineer Department, Baghdad,  
Iraq. inas_abbas@yahoo.com

Cement Based Solidification/Stabilization  
Leaching Performances of Selected Heavy  
Metal Ions under Different pH  
Extractions

Abstract- Liquid to solid partitioning as a function of pH leaching  
Procedure LSP EPA method 1313 was carried out to test the  
effectiveness, performance and efficiency of the cement-based  
solidification / stabilization (S/S) of heavy metals contaminated sand  
samples using Ordinary Portland Cement OPC type A. Two cement  
based mix designs (7 and 25%) have been applied to (S/S) sand  
contaminated samples with different heavy metal ions (Pb, Cu, Cr, and  
Cd) having the following concentrations (500, 1500 and 3000 mg/kg).  
Fixed water to cement ratio of 0.45 was maintained for all the  
experiments. Effective retention levels for the heavy metal ions was  
achieved using a 25% OPC mix ratio to (S/S) the contaminated samples  
even when the extraction solutions were of pH levels as low as 2.  
Leaching experiments showed that as the pH level of the extraction  
solution is reduces and as the OPC content in the (S/S) samples is reduced  
the more heavy metal ions that can leach out. Up to 80% of chromium,  
cadmium, lead, and copper ions leachability can be prevented when  
higher cement content is introduced to the solidification / stabilization  
process under the same pH extraction. Acidic extraction effects and  
solubilized the Calcium – Silica – Hydrate (C-S-H) gel that is created by  
The OPC binder, which holds, and contain the heavy metal ions and thus  
results in more release of those ions into the extraction solutions. The  
alkaline environments provided by the cement binder are believed to have  
participated in the precipitation of several metal ions such as cadmium and  
lead io, leading to their less detection in the leaching extracts.  
Alkaline extraction experiments (pH 8-13) showed that the mobility of the  
metal ions under the same experimental conditions followed the order of  
\(pb > Cr > Cu > Cd\) in samples of various cement contents.

Keywords- Solidification / Stabilization; Heavy Metals; LSP; Leaching.

How to cite this article: B.A. Hussain, Sh.E. Ebrahim and A.H. Sulaymon, “Cement Based Solidification/  
Stabilization Leaching Performances of Selected Heavy Metal Ions under Different pH Extractions,”  