



國立臺北科技大學

資源工程研究所

碩士學位論文

擦洗程序應用於去除受污染土壤中
重金屬之研究

A Study on the Attrition Scrubbing Process
Applying to Removal of Heavy Metals from
Contaminated Soils

研究生：許智為

指導教授：柯明賢

中華民國 102 年 1 月

摘要

論文名稱：擦洗程序應用於去除受污染土壤中重金屬之研究 頁數:76

校所別：國立台北科技大學 資源工程研究所

畢業時間：一百一學年度第一學期

學位：碩士

研究生：許智為

指導教授：柯明賢

關鍵詞：擦洗、重金屬、受污染土壤、分離、富集

由於受重金屬污染土壤中之污染物較易吸附或鍵結於土壤顆粒的表面，因此，本研究探討將擦洗法應用於受重金屬污染土壤整治之可行性。本研究以礦漿濃度、擦洗時間、轉速等操作條件進行受重金屬污染土壤之擦洗實驗，而本研究以 XRF 進行受重金屬污染土壤中重金屬濃度分析，分析不同粒徑土壤中重金屬含量之分布，以探討不同擦洗條件對受重金屬污染土壤整治效果之影響，並評估擦洗法應用於受重金屬污染土壤整治之可行性。本研究係以兩處不同污染特性之受重金屬污染土壤(NS、SS)作為研究對象，經基本特性分析之結果，可發現 NS 土壤中的重金屬 As、Cu、Pb 濃度均超過土壤管制標準，SS 土壤中的重金屬 As、Cr 濃度也超過土壤管制標準。另外以 SEM 顯微結構觀察可以發現兩批土樣的粗顆粒土壤表面含有大量的極細顆粒污染物。另外。而經擦洗實驗結果可以發現，針對 NS、SS 受重金屬污染土壤以礦漿濃度 70%、擦洗時間 15 分鐘、轉速為 1400 rpm 為最適之擦洗操作條件，且由擦洗前後重金屬結合型態分析結果可以發現，擦洗程序對於土壤中重金屬 Cr、Cu、Pb 之鐵錳氧化態與碳酸鹽態的去除有明顯增加的趨勢，對於土壤中之 As 結合型態卻無顯著的影響，因此，綜合以上研究結果可以得知，利用擦洗程序做為受重金屬污染土壤之前處理具有可行性，可有效提升細顆粒土壤中重金屬之富集效果，而有助於後續土壤分級處理之分離效率。

ABSTRACT

Title: A Study on the Attrition Scrubbing Process Applying to Removal of Heavy Metals from Contaminated Soils.

Page : 76

School : National Taipei University of Technology

Department : Institute of Mineral Resources Engineering

Time: January, 2013

Degree : Master

Researcher : Zhi-Wei Xu

Advisor : Ming-Sheng Ko

Keywords : attrition scrubbing, heavy metals, contaminated soils, separation, enrichment

The fine fraction of contaminated soil particles (clay and silt) tends to concentrate with heavy metals, so it is important to find effective ways of separation between coarse and fine particles on pollution control of heavy- metals contaminated soils. In this study, the attrition scrubbing process was performed to investigate the influence of scrubbing conditions, including slurry concentration, scrubbing time, stirring speed, on enrichment of heavy metals in contaminated soils. In addition, through sequential extraction experiments, the chemical characteristics including existence pattern of heavy metals of contaminated soil before and after scrubbing were compared.

From the results of chemical characterization, it showed that the NS soil was contaminated with Cu, Pb, As, and the SS soil was contaminated with Cr, As. The concentrations of the above heavy metals in these two soils exceeded the regulatory threshold established by the Environmental Protection Agency of Taiwan. By SEM

observation of soil surface, it found that a large quantity of finer particles with pollutants is attached to the coarse surface of soil particles. The results of attrition scrubbing test showed that the optimum conditions for separating Cu, Pb, As and Cr from the contaminated soil or concentrating them into a particular soil fraction were at 70 % of solid slurry, scrubbing time of 15 minutes and impeller speed of 1400 rpm. It is obvious that the finer soil particle is, and the higher heavy metal concentration is. Based on the above results, it is feasible that the attrition scrubbing is used for pretreating heavy metal-contaminated soil to concentrate heavy metal content on finer particles.

