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# Stabilization of Arsenic and Heavy Metals in Contaminated Soils and Tailings Using Various Materials by Column Test

**Han-Ku Chi[1] · Myung Chae Jung[2]**

[1]*Division of Environmental Technology, Dongmyung Enterprise*
[2]*Dept. of Earth Resources and Environmental Geotechnics Eng., Semyung University*
e-mail: jmc65@semyung.ac.kr

## ABSTRACT

Column test for evaluating stabilization of As and heavy metals using various stabilizing materials including apatite, slaked lime and Bauxsol™ was adapted. After environmental survey for As and heavy metal contamination, 4 representative mines, the Janggun Pb-Zn mine, the second Yeonhwa Pb-Zn mine, the Jisi Au-Ag mine and the Sangdong W mine in Korea, were selected to examine the possibility of stabilization of contaminated soils and tailings by several geochemical materials. According to Korean standard method for survey of soil contamination, As and heavy metal concentrations in the samples were determined by AAS as various extraction methods including 0.1N HCl for Cd, Cu and Pb, 1N HCl for As and aqua regia for Ni and Zn. Chemical leaching tests of KSLT, SPLP, TCLP were also included. After chemical analysis of raw materials, column test was adapted to evaluate the stabilization ability of As and heavy metals by apatite, slaked lime and Bauxsol™(Acid-B and Terra-B). In the test, columns in size of 8x24cm(DxH) with a flow rate of 0.3mm/min were arrayed as the four materials mixed with 0, 1, 5 and 10 wt% in 1.0kg of each tailings sample. In spite of variation depending upon each sample, it was generally accepted that the pH values in treated water were increased at early stage and the stabled as a neural condition. Comparing the effectiveness of the four stabilizing materials, slaked lime had better efficiency in terms of preventing extraction of As and heavy metals in samples from the Jisi mine with the efficiencies of 98, 97, 99, 86 and 99% of As, Cd, Cu, Pb and Zn, respectively. The efficiencies for apatite and Bauxsol™ were 48 and 96% of As, 61 and 72% of Cd, 82

and 96% of Cu, 77 and 88% of Pb and 79 and 81% of Zn sampled from the Jisi mine, respectively. Samples from the other mines were also similar to those from the Jisi mine. In a view of the best mixing ratio for stabilizing material, mixing with 5 wt% of stabilizing materials in soils and tailings was enough to stabilize As and heavy metals. In conclusion, stabilization efficiencies for the elements were increased in the order of apatite < Bauxsol™(Acid-B) < Bauxsol™(Terra-B) < slaked lime. Dynamics of elements under the natural conditions, however, might be different from the column test. Thus, further study including scale-up and long-term test under the various conditions will be undertaken.

Key words: Column test, As, Heavy metal, Stabilization, Extraction characteristics