

Experimental study on the biochemical conditions and their effects on the heavy metal mobility in incinerated ash layers at coastal landfill site

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1. Introduction

Recent studies indicate the environmental impact cause by the heavy metal leaching from incinerated ash at disposal sites. The coastal disposal sites usually contain high level organic matters and salt, and because of its closed structures, inside of disposal site more likely to be anaerobic condition if incremented ash is damped at the sea. Therefore, anaerobic -specific microbial activities inside of disposal site affect on its biochemical condition and the mobility of heavy metals.

2. Purpose

The purpose of this research is to understand the changes in the chemical condition, and its effect on the behavior of heavy metal, and effects of interaction between incinerated ashes and clay liner at the bottom of disposal site. Heavy metal leaching behavior was evaluated by conducting test simulating the inside condition of sea area disposal sites.

3. Methods

- (1) Batch elution testing: After mixing soil sample and solvent, suspension was prepared and analyzed regular basis. This testing uses marine clay as the sample and two types of solvent, one with electron acceptor and nutritive salt and the other without such additives in artificial sea water. Two different cases with two different solvent were studied.
- (2) Column percolation elution testing: After filling column with test pieces, falling head permeability test was conducted and discharge water was analyzed chemically. The testing uses two types of column for the analysis one was filled with layered incinerated ash and marine soil, and the other was filled with mixture of incinerated ash and marine soil.

4. Results and Analysis

1. Lower pH level increases zinc elution. As low pH level enhance microbial activities and it causes decrease in Eh level. Zinc forms precipitations with poor solubility and it reduced the mobility of zinc.
2. Result of column percolation elution testing showed mixture of incinerated ash and clay causes decrease in buffering capacity against pH of clay and its adsorption capability.

5. Conclusion

- High level of microbial activity stabilizes zinc elusion in disposal site. If the solvent is alkaline, though the level of microbial activity is low, zinc does not elute since zinc exist as insoluble form.
- By mixing incinerated ash and clay, performance of clay liner will be limited. Therefore, in order to assess the heavy metal elution in the part of clay liner, the effect of mixture with incinerated ash should be considered.

6 . Challenges in the future

- Transition of microbial activity from aerobic to anaerobic condition was not enough in butch elution testing. It is necessary to continue the testing and to analyze the chemical condition at strongly reduced condition and the change in heavy metal elusion pattern.
- Model test simulating the condition of actual sea area waste disposal site is necessary for the further analysis of heavy metal elution and its condition in the actual environment.