

Heavy metal immobilization capacity of solidified coal ash.

T. TSUBOTA*, M. YOSHINAGA*, T. NAGANO* Y. IMAIZUMI*,
A. TACHIFUJI[°], Y. MATSUFUJI[°], N. ASHIKAWA^{°°}, S. TAWAKI^{°°} and N.
MATSUOKA^{°°}

* *Kyushu Electric Power Co., Inc.*

2-1-47 Shiobaru Minami-ku, Fukuoka 815-8520, Japan

[°] *Dept. of Civil Engineering, Faculty of Engineering, Fukuoka University, Japan*

^{°°} *Kyushu Environmental Evaluation Association, Japan*

Abstract

In Japan, most combustible municipal solid waste is incinerated because vacant space for landfill is limited. Inorganic salts and heavy metals are concentrated in the incineration residues. Therefore, the landfill leachate contains heavy metals and the other harmful materials.

On the other hand, coal ash from coal combustion power plants needs an effective use. Calcium, which is the main component of coal ash, is able to immobilize heavy metals contained in the leachate by making calcium scale.

In this study we tried to immobilize heavy metals in leachate by using activated cover soil, with added coal ash. The shaking test and the column penetration test were carried out to measure the heavy metal immobilization capacity of coal ash. The coal ash was molded, about 1 cm in diameter, adding bentonite and/or water to make it easier to handle the coal ash.

The heavy metal (Pb, Mn, Cd and Cr) immobilization capacities of the molded coal ash were higher than those of the ordinary natural cover soil. The manganese immobilization capacity of the coal ash was more than 11 mg-Mn/g-ash.

In addition we examined a small semi-aerobic landfill modeled lysimeter in order to confirm the immobilization effect of the heavy metal in the molded coal ash. The lysimeter had a depth of 50 cm, a surface area of 625 cm² (25 cm square), and was filled from the bottom in order of pebbles (5 cm), sand (20 cm), molded coal ash (5 cm) and sand (20 cm).

Actual landfill leachate, with 100 mg/L chloride solution each of heavy metals (Pb, Mn, Cd and Cr) sprinkled on the top of lysimeter. After that, the heavy metal concentration in leachate from the lysimeter was measured by ICP-AES.

The sprinkled solution was adjusted to the high concentration of Mn only, since the actual landfill leachate with added Pb, Cd and Cr chloride formed a precipitation of Pb, Cd and Cr hydroxide. As a result the leachate of the lysimeter contained only Mn.

The total amount of Mn in the leachate was less than in the sprinkled solution. This shows that Mn was captured by the filled material in the lysimeter. According to the EPMA analysis, Mn was concentrated in the surface of the molded coal ash. This suggests that applying coal ash to the cover soil could immobilize Mn.