

NEUTRALIZATION OF INCINERATOR ASH LANDFILL LAYER BY HIGHLY CO₂ DISSOLVED WATER

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INTRODUCTION

Incinerator ash is the main landfilled waste at landfill for municipal solid waste in Japan. Therefore, the landfill layer remains alkaline for a very long time. At some disposal sites, leachate has a high pH for a long period of time, and the pH does not reach the wastewater standard (<8.6). There are many cases of studies on neutralization of incinerator ash and insolubilization of heavy metals using carbon dioxide, and certain effects have been reported in Japan. The problem is that CO₂ does not reach the inside of the incinerator ash particles and sufficient carbonation does not proceed. At the covered landfill, moisture control is carried out by artificial watering.

In this study, a CO₂ highly dissolved solution using ultrafine bubbles (UFB) was supplied to the glass bead layer and incinerator ash layer. CO₂ abundance in water and the promotion of the neutralization reaction were investigated.

METHODS

Carbon dioxide (CO₂) dissolved water

The device for generating high dissolved CO₂ solution (hereafter referred to as CO₂ dissolved device) consisting of a UFB generating loop flow type OK nozzle (OK Engineering Co. Ltd) and pump were used (Photo.1)



Photo 1 CO₂ dissolved device

Dissolved CO₂ in the glass bead layer

The column packed with glass beads (inner diameter 42.5 mm, 1mm diameter glass beads, layer thickness of

50mm or 150mm) was used for measuring of CO₂ dissolved condition. (Photo2).

CO₂ dissolved water was dripped from the top of the glass bead layer at a flow rate of 2.37 mL/min (100 mm/h in terms of rainfall) and 4.73 mL/min, and the IC concentration of the effluent was measured.

Neutralization of incinerated ash layer with CO₂ dissolved water

The column packed with incinerator ash (inner diameter of 53.8 mm and a layer thickness of 150 mm, ash weight 270g) was used for investigating as neutralization condition). (Photo 3)

CO₂ dissolved water and pure water were dripped at 5 mL/min (132 mm/h in terms of rainfall), which is assumed to be the maximum amount of permeation possible. The pH, EC, ORP and IC of the leachate discharged from the column were measured.

At end test, leaching test (JLT13) was done for incinerator ash at top, middle, bottom layer.



Photo2 Glass bead packed column



Photo3 Incinerator ash packed column

RESULTS AND DISCUSSION

Dissolved CO₂ in the glass bead layer

Figure 1 shows the IC concentration at 50mm and 150mm glass bead layers. The supply water IC concentration of the CO₂ dissolved device has a range

of about 120-180mg-C/L.

The outflow rate (outflow IC/inflow IC) at a layer thickness of 150mm was 62.8-67.1%.

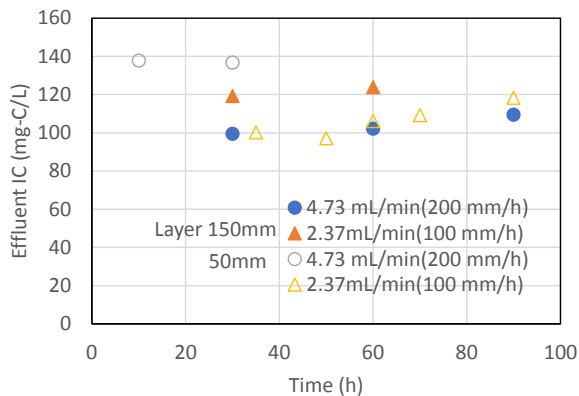


Figure 1 Change in IC concentration (glass bead layer)

Neutralization of incinerated ash layer with CO₂ dissolved water

Figure 2 shows the pH of leachate from the incinerator ash layer. When CO₂ dissolved water (UFB-CO₂ water in the figure) was introduced into the incinerator ash layer, the pH of the leachate was lower than that of pure water. From this, it was inferred that the incinerator ash was neutralized.

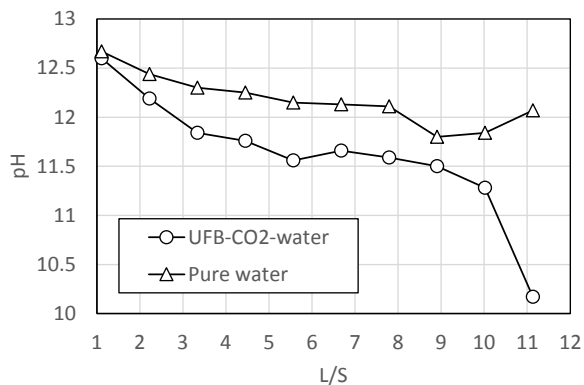


Figure 2 Leachate pH (CO₂ dissolved water, pure water)

Figure 3 shows the electrical conductivity (EC) of leachate from the incineration ash layer. There was no difference between passing CO₂ dissolved water (UFB-CO₂ water in the figure) and pure water, and EC decreased rapidly. It was considered that the effect of CO₂ was not observed in washing out the salts contained in the incinerator ash.

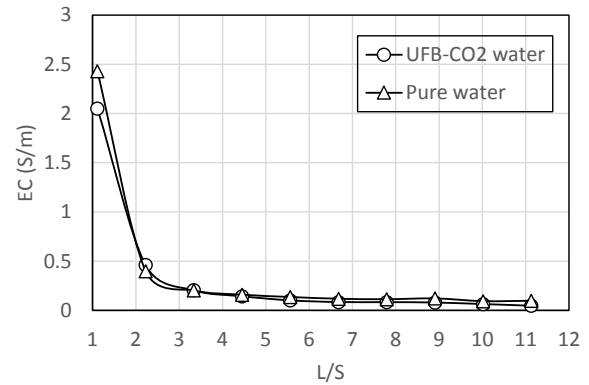


Figure 3 Electrical conductivity of leachate

Figure 4 shows the pH in the leaching test by depth. The eluate pH with CO₂ was lower than that with pure water. From this, neutralization of incinerator ash was confirmed.

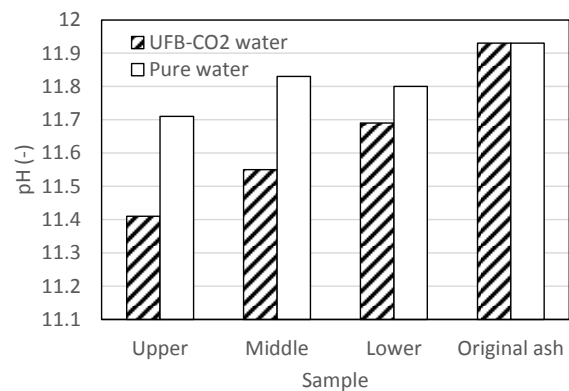


Figure 4 Packed incineration ash elution pH (in column)

SUMMARY

When CO₂ dissolved water was passed through a 150mm incinerator ash layer, the pH of leachate was lower than that of pure water.

From the results of the leaching test of the incineration ash, the neutralization of the incineration ash progressed slowly due to the CO₂ dissolved water flowing down.

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