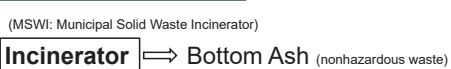


INTRODUCTION

MSWI Fly Ash



Fly Ash:
1% of MSW, contains soluble salts, dioxins and heavy metals. It's hazardous waste.

Fly Ash

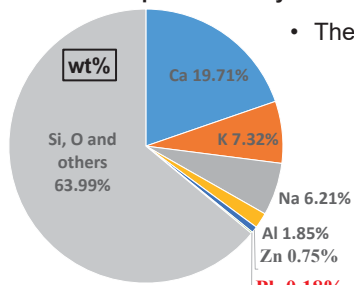
Fly Ash Processing

1. Solidification with Cement
2. Thermal Treatment
3. Chelating Agent
4. Acid Extraction
- Etc.

Most prevalent method in Japan. Decomposition of chelate-metal complex and re-release of Pb after several years are reported.

Elemental Composition of Fly Ash

- The fly ash used in this study.



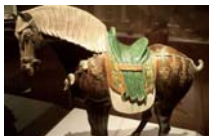
Pb in Fly Ash:

- Pb in fly ash is mainly **chloride**, which is easily soluble.
- Concentration determined by Leaching Test (JLT-13) of this FA is **Pb: 63 mg/L**

Aluminosilicate

Aluminosilicate: Aluminosilicate are minerals composed of **Al, Si**, and **O**, plus counter cations. **Feldspar** is a kind of nature aluminosilicate mineral that make up about **41%** of the Earth's continental crust by weight.

Lead Glaze

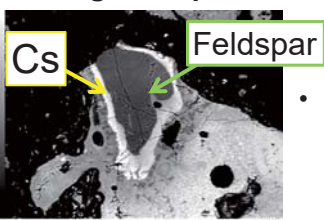


Lead Glaze: Lead glaze is mainly made by **feldspars** and **PbO**, it is used as cover for pottery and porcelain. After combustion, lead glaze will become glass-like structure to protect the ware from penetrate by water and **insolubilize Pb** in the glaze.

Fig. A sancai lead-glazed earthenware saddled horse statuette, Tang Dynasty, colored lead glazes.

PREVIOUS RESEARCH

Using Feldspars to Insolubilize Cs



2013 Ishii

- After co-heating, Cs is captured in amorphous glass phase formed on surface of **Potassium Feldspar (KAISi₃O₈)**.

2017 Itoga

The optimal temperature to insolubilize Cs is **700°C**.

Cs(%) 0 20 40 60 80 100

- Amorphous Indian Feldspar + CsCl

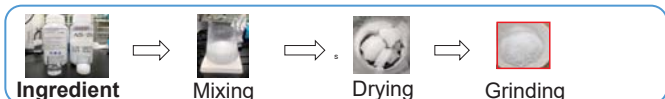
OBJECTIVE

1. To prove whether aluminosilicate can insolubilize Heavy metals or not.
2. To confirm aluminosilicate can insolubilize Pb in fly ash.
3. To find out the **optimal condition** for aluminosilicate to insolubilize Pb in fly ash, different setting of heating were examined.

EXPERIMENT

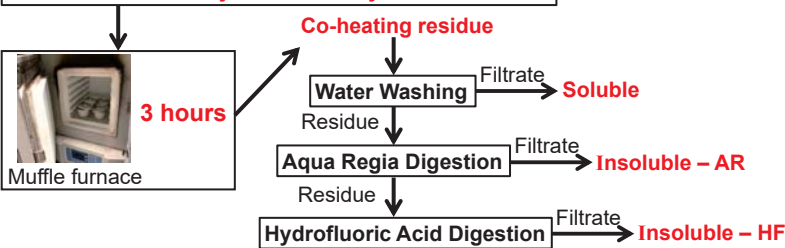
Materials - Aluminosilicates

1. **Amorphous Indian Feldspar:** Made by grinding powder one with planetary ball mill at **450rpm** for **6 hours**.
2. **Sol reagent:** Made by mixing **SiO₂-sol, Al₂O₃-sol** and **K₂CO₃** by molar ratio **Si : Al : K = 3 : 1 : 1**. Mixed materials then be dried and grinded to powder.



Method

Aluminosilicate + Fly Ash / Heavy metals chloride



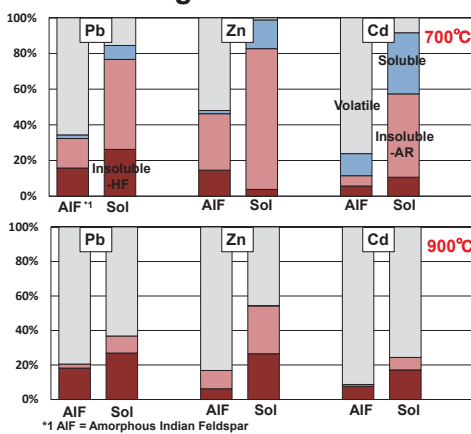
RESULT

Co-heating Aluminosilicates with chloride

Materials for Co-heating:
Aluminosilicates + Chloride
7g 1g

For Object-1

- The figures is showing:
1. Insoluble part of heavy metals exist, which should not without co-heating.
 2. Compare to 900°C and AIF, 700°C and sol can make more heavy metals insoluble.



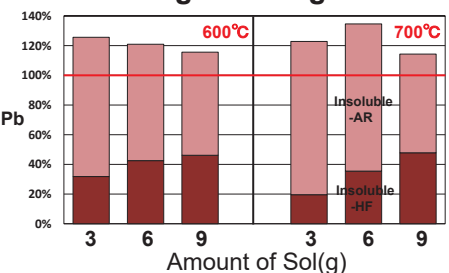
✓ **Aluminosilicates can insolubilize heavy metals in chloride.**

Co-heating Sol Reagent with Fly Ash

Materials for Co-heating:
Sol Reagent + Fly Ash
3 / 6 / 9 g 3g

For Object-2

- The figures is showing:
1. No soluble and volatile Pb.
 2. But the insoluble Pb is over initial amount of Pb in the fly ash.



✓ **Aluminosilicates can insolubilize Pb in Fly Ash.**

Confirmation Run – Co-heating by Tube Furnace

can collect volatile Pb

Materials for Co-heating:
Sol Reagent + Fly Ash
3g 3g

✓ **Volatile Pb is nearly Zero. Volatile: 0.21%**

Confirmation Run – Retest Soluble Pb

Table: Soluble Pb in the residue after co-heating with 3g FA

Temperature	600			700		
Sol reagent(g)	3	6	9	3	6	9
Concentration of Pb	1.56ppb	2.03ppb	1.41ppb	1.75ppb	0.83ppb	1.23ppb

✓ **Soluble Pb is ppb level.**

Optimal condition for insolubilizing Pb

