

## Relationship between PM emitted from MSWI plant and PM<sub>2.5</sub> in ambient air around plant about chemical states of sulfur and chlorine

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### 1 Introduction

It has been thought that municipal solid waste incinerator (MSWI) plant is one of the major stationary sources for particulate matter (PM) emission. However, PM emission from MSWI plants might be decreasing because of introduction of state-of-the-art flue gas treatment equipments for dioxins control, and there have been limited reports to measure amount of PM emission in recent year. It is important to understand present PM emission from MSWI and contribution of the emission to PM in air. This report aims to investigate relationship between PM from MSWI and PM<sub>2.5</sub> in ambient air around MSWI plant by analyzing chemical form of sulfur (S) and chlorine (Cl) in PM from MSWI by XAFS Spectroscopy.

### 2 Experiment

PM samples emitted from MSWI plant were collected in nine particle size fractions (from sub  $\mu\text{m}$  to about 10  $\mu\text{m}$ ) by an Andersen stack sampler (Tokyo dylec corp., AS-500) inserting into the flue gas ducts at the inlet of the stack [1]. PM<sub>2.5</sub> samples in the air around the plant were collected in one fraction under 2.5 $\mu\text{m}$  size particles (PM<sub>2.5</sub>) by Low Volume Sampler (Tokyo dylec corp., FRM2000).

XAFS spectroscopy for sulfur (S) K-edge and chlorine (Cl) K-edge in the PM and PM<sub>2.5</sub> samples were carried out by CEY or TEY, and FY modes at 9A and 11B.

### 3 Results and Discussion

The XAFS spectra of S and Cl in the samples are shown in Fig. 1. According to S K-edge NEXAFS spectra, sulphate was predominant in both of PM from the plant and PM<sub>2.5</sub> in the ambient air. The spectra of PM from the plant had similar shapes in each particle size. The energy of whiteline peak top in the spectra of PM<sub>2.5</sub> in the air shifted lower than that of PM from the plant, so chemical states of PM<sub>2.5</sub> in the air were different from that of PM from the plant. It was inferred that sulphate in PM<sub>2.5</sub> in the ambient air is predominantly (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> and that in PM from the plant is predominantly NaSO<sub>4</sub> from results of ion chromatography and whiteline peak shift [2] [3].

Cl K-edge NEXAFS spectra showed that PM from the plant contained predominantly Cl as NaCl in each particle size. On the other hand, the spectrum of PM<sub>2.5</sub> in the ambient air had also absorption on about 2820 eV, lower energy than absorption of NaCl. Cl-K edge spectra in organic chlorine compounds have lower absorption energy than that of inorganic compounds [4], so that PM<sub>2.5</sub> in the ambient air might contain organic chlorine compounds.

In conclusion, chemical states of S and Cl in PM<sub>2.5</sub> in ambient air around MSWI plant were different from those in PM from MSWI plant, and this suggested that PM emission from MSWI plant do have little impact to PM<sub>2.5</sub> if contribution of secondary formed particles from gas phase is not considered.

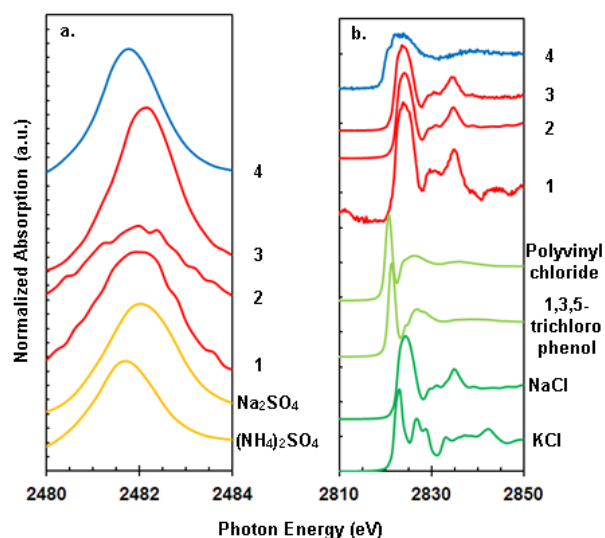


Fig. 1: NEXAFS spectra of PM from MSWI plant and PM<sub>2.5</sub> in ambient air around MSWI plant. a.:S K-edge, b.:Cl K-edge. 1~3 : PM from MSWI plant, 1: 1.0~2.0  $\mu\text{m}$ , 2: 0.40~0.58  $\mu\text{m}$ , 3: <0.40  $\mu\text{m}$ . 4:PM<sub>2.5</sub> in ambient air around MSWI plant

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