Volatilization and Decomposition of Dioxin from Fly Ash

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The dioxin volatilization and decomposition process was developed to remove dioxin from fly ash in MSW (Municipal Solid Waste) incinerators. In this process, dioxin adsorbed on the surface of fly ash is volatilized to the gas phase and then decomposed by catalytic or high temperature treatment. This process significantly suppresses dioxin reformation by de-novo synthesis in the treated fly ash because of the simultaneous removal of other organic compounds that may be sources for dioxin reformation.

1. Introduction

The control of dioxin emissions from MSW incinerators has primarily focused on the dioxin in flue gas. However, measures to decrease dioxin in the residue are also critical for reducing the total release of dioxin from MSW incinerators. Reductions of dioxin in the fly ash will greatly lower the total amount released because dioxin are more concentrated in the fly ash than in any other stream from a MSW incinerator. The concentration of dioxin in fly ash should be less than 0.1ng-TEQ/g to achieve emissions below 5 μg-TEQ/ton MSW[1]. We have been developing a process for the volatilization and decomposition of dioxin from fly ash.

The volatilization behavior of dioxin from fly ash was evaluated, and pilot-plant tests of the volatilization and decomposition process were performed in the present study. In this process, dioxin adsorbed in fly ash is effectively desorbed and/or volatilized to the gas phase. The gas phase dioxin is then decomposed by catalyst. This process can significantly suppress the reformation of dioxin by de-novo synthesis in the treated fly ash because of the simultaneous removal of other organic compounds that can provide sources for dioxin reformation.

2. Volatilization and decomposition process

A flow chart for the volatilization and decomposition process of dioxin from fly ash is shown in **Fig.1**. Dioxin has a boiling temperature ranging from 315 to 537 and a vapor pressure ranging from 5.1E-4Pa to 3.2E+2Pa at 125 [2]. When fly ash was heated in a gas flow with 10% oxygen at 350 , 94% of the dioxin was detected in the gas phase[3]. These reports imply that the dioxin adsorbed in fly ash can be effectively volatilized to the gas phase by heating in a gas flow. Other organic compounds that have the potential to form dioxin are also evaporated at the temperatures needed

measured for the gas phase at 250 and 400 , as shown in **Fig.3**, and for fly ash before and after heat treatment.

Fig.2 Experimental set-up for analysis of dioxin and organic compounds volatilized from fly ash

Fig.3 Heating step for dioxin analysis

3.2 Pilot plant test

A schematic diagram of the pilot plant is shown in **Fig.4**, and the conditions of the test are listed in **Table 1**. The pilot plant did not have cooling system for the fly ash after

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