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A STUDY ON THE CHEMISTRY OF ASH FRACTIONS FROM MSW INCINERATION

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Abstract
In this work, a methodology for analysis and characterization of different ash fractions (bottom ash, 2-3rd pass ash, super-heater ash, economizer ash and filter ash) generated from the incineration of MSW in a grate firing plant is presented. The methodology is shown to provide detailed information regarding the chemical composition and the main characteristics of the generated fly and bottom ash that could provide valuable information concerning the handling of ash-related problems, (slagging, fouling, corrosion), and also ash disposal problems. Comparison of the results obtained with results from corrosion studies with MSW ash showed that the sampling point and the sampling procedure significantly affect the results obtained.

Keywords: ash, leaching, MSW, incineration

1. Introduction

Ash-related problems in the form of fouling, slagging, corrosion and erosion comprise one of the biggest obstacles towards the safe, economical and environmental friendly utilization of a large variety of biomass and waste fuels, (straws, hulls, MSW, sewage sludge), for heat and power production via thermochemical conversion methods.

In specific, the ash fractions investigated appeared to be rich in alkali metals, chlorine and sulphur, usually in very reactive forms such as simple inorganic salts, (KCl, NaCl), inorganic grains finely dispersed in the organic structure of these materials or as cations associated with the organic structure of the materials.

During thermal treatment, the inorganic part undergoes a number of transformations forming gases, liquids and solids that can react further or re-condense on the cooler surfaces of the furnace or on the heat transfer surfaces forming ash deposits. These deposits may continue to grow with time since they usually create a sticky surface layer that increases the capture efficiency of the deposit, while they increase corrosion, slagging and fouling effects and may inhibit the heat transfer to the steam cycle. [1-5]

Furthermore, in the case of municipal solid waste (MSW) incineration plants, the deposition and the corrosion processes can be also affected by the presence of heavy metals such as zinc and lead in the forms of chlorides and sulphates. These compounds have very low melting points, e.g. 290°C for $ZnCl_2$, 501°C for $PbCl_2$ and 680°C for $ZnSO_4$, and they may also interact with compounds such as the KCl and the alkali metal sulphates present in large amounts in the ash material deposited after MSW incineration. This leads to the formation of molten phases with even lower melting points compared to the pure salts, i.e., 250°C for the $ZnCl_2$/KCl (48/52%wt.) mixture accelerating significantly the deposition and the corrosion processes. [6-11]

The presence of large amounts of heavy metals (Zn, Pb, Cu, etc.) and also alkali chlorides and sulphates in the ash formed during the MSW

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