FRACTIONATION AND MOBILITY OF THE HEAVY METALS PRESENT IN MULTIPAL SOLLID WASTE INCINERATION BOTTOM ASH

Alexander de Wolf, Q. Alam, K. Schollbach, M.V.A Florea, H.J.H Brouwers,

Department of the Built Environment, Eindhoven University of Technology, P. O. Box 513, 5600MB, Eindhoven, The Netherlands.
t.dewolf55@gmail.com

Keywords: MSWI Bottom ash; Heavy Metals; Sequential extraction; Ion chromatography

Introduction

Every year tons of waste, consisting of everyday items, are produced and needs to be disposed. Municipal solid waste incineration (MSWI) is the most effective method to deal with such large quantities. Bottom ash (BA) among others is one of the major incineration by-products. Currently, BA is used as a secondary building material for acoustic barriers (Pera et al. 1997) and as aggregate in concrete (Abbà et al. (2014). However, due to the high concentration of heavy metals and their environmental impact, a deeper understanding regarding their mobility and chemical association is required to assess their effects on the environment.

Methods

In this study, three different fractions, large (1-4 mm), medium (0.125-1 mm) and small (<0.125 mm) of BA were investigated for the distribution of heavy metals (Pb, Cu, Ni, Zn, Fe, Mn). The revised BCR 3-steps sequential extraction procedure was applied to these fractions (Rauret et al. (1998). Furthermore, an additional step of extraction with aqua regia was also included as a fourth step. These steps were employed to target the specific phases to liberate heavy metals.

The BA extracts of each fraction were analyzed with ion chromatography (IC) to attain a better understanding of the oxidation state of the heavy metals. For the IC method, a mobile phase of pyridine-2,6-dicarboxilic acid (PDCA) with a flow of 0.3 mL/min was used, with [4-(2-pyridylazo) resorcinol] as a post-column reagent and a flow of 0.15 mL/min. A column with both cationic and anionic capabilities was used to separate the anionic complexes that are formed between the heavy metals and the PDCA. Flame-AAS was used as an extra control for the analysis of the heavy metals in the BA extracts.

References

Pera, J.; Coutaz, L.; Ambroise, J.; Chababbet, M. (1997). “Use of Incinerator Bottom Ash in Concrete.” *Cement and Concrete Research*, 27, 1–5.

Abbà, A.; Collivignarelli, M. C.; Sorlini, S.; Bruggi, M. (2014). On the reliability of reusing bottom ash from municipal solid waste incineration as aggregate in concrete. *Composites: Part B, 58,* 502 – 509.

Rauret, G.; López-Sánchez, J. F.; Sahuquillo, A.; Rubio, R.; Davidson, C.; Ure, A.; Quevauviller, Ph. (1998). Improvement of the BCR three step sequential extraction procedure prior to the certification of new sediment and soil reference materials. *Journal of Environmental Monitoring, 1,* 57 – 61