STUDY ON BEHAVIOR OF ANTIMONY, ZINC, LEAD AND IRON OXIDES DURING THERMAL PROCESSING OF BFR-CONTAINING WASTE PLASTICS WITH USING A LABORATORY FURNACE

M. Grabda[1,2]*, S. Oleszek[1,2], E. Shibata[2] and T. Nakamura[1]

[1] Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, Sendai, Japan
[2] Institute of Environmental Engineering of the Polish Academy of Sciences, Zabrze, Poland

e-mail: mariusz@mail.tagen.tohoku.ac.jp , Tel./Fax: (+81)222175214

Abstract

Tetrabromobisphenol A (TBBPA) is the largest volume brominated flame retardant (BFR) in production today, used in more than 70 % of the world's electronic and electric (E&E) appliances as well as in many plastics, textiles and so forth. Commonly, antimony oxide (Sb_2O_3) is mixed with the organic BFRs to synergistically inhibit flammability of the plastic products.

In Japan, most common method for dispossing of the BFR-containg waste plastics is thermal treatment. BFRs easily decompose during the thermal processing, generating significant amounts of gaseous hydrobromic acid (HBr). HBr is present mostly in the flue gas and can act as bromination agent. Our proposal is to use it for selective bromination-evaporation of metals present in co-combusted metallurgical dusts, like zinc and lead-rich electric arc furnace (EAF) dust.

The controlled co-combustion of the mixed wastes might be applied for simultaneous recovery of both: energy from waste plastics as well as valuable inorganic fraction from the dusts.

In this study, a laboratory-scale furnace was used to investigate (1) reactivity of zinc, lead, and iron oxides with the product of the thermal decomposition of TBBPA, and (2) conditions affecting effectiveness of the bromionation-evaporation process, and (3) behavior of Sb_2O_3 in during the thermal processing.

Keywords: BFR-waste plastics, thermal processing, EAF dust, bromination-evaporation