Influence of metallic fragments magnetic separation on the MSWI bottom ash chemical composition

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Bottom ash (BA) is a main product of municipal solid waste incineration (MSWI), which is a process widely used to reduce waste volume and mass (up to 90% and 70% respectively) causing simultaneous concentration of metallic elements previously dispersed within waste. In raw BA metallic elements occur in several forms: as fragmented metal products, alloys and grains rich in metallic elements as well as components of mineral and amorphous phases.

To increase the value of bottom ash as a raw material several techniques of extraction of valuable components are used. Among them metallic fragments separation using magnetic and eddy current separators is often performed. Separation of metallic elements allows to recover valuable components of BA with simultaneous reduction of toxic metallic elements content.

To investigate the influence of magnetic separation on BA chemical composition materials after first and second stage of magnetic separation were collected in 2015 from one of the biggest MSWI plant in Poland. The chemical composition of BA samples was defined using inductively coupled plasma optical emission (ICP-OES) and mass spectrometry (ICP-MS).

BA is a multicomponent grainy material where after first stage of magnetic separation (for ferrous metals) still ~5 wt% of fragmented metal products were present. Over 95% of that amount was effectively removed in a second stage of magnetic sepration by eddy current separators.

The overall metallic elements content in the BA material (after first separation stage) was ~11 wt% (Al, Fe, Mg, Ti, Mn, Cr, Ni, Mo, Cu, Pb, Zn, Sn). From that amount after second stage 2-3 wt% of metallic elements was removed. The content of Al, Mg, Ni, Sn, Mn, Pb and Zn has not changed, whereas ~80 wt% of Fe, ~20 wt% of Ti, ~40 wt% of Mo, Cr and up to 50 wt% Cu was removed effectively.

The remaining part of metallic elements was dispersed within BA material, what prevents their recovery without using additional processing techniques.

Acknowledgment: Research was funded by Polish National Science Centre (grant No. UMO-014/15/B/ST10/04171).