Recovery or reuse of metals from municipal solid waste incineration residues

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Incineration of municipal waste reduces their volume and mass significantly and results in increase of metals content in the incineration residues (bottom ash and fly ash). Recovery of metals from incineration residues enhance recycling level and can be considered as a component of transformation towards a more circular economy and sustainable development. Metal content in wastes varies from 3 wt% for low income to 6 wt% for high income countries and is related to numerous local factors.

More than 500,000 tons of non-ferrous metals is produced currently in Poland from recycled material. Since 2009 aluminium is not produced from primary material. Newly constructed incineration plants in Poland with total capacity of 975,000 tons of waste per year give possibilities to increase the stream of supply of recycled metals by their recovery from waste incineration residues. The content of Fe and Al in the studied bottom ash is 5.41 and 3.73 wt% respectively. Efficiency of metals recovery depends on the form of their occurrence (pure metals, alloys, metals in crystalline or amorphous aluminosilicates) and size of metallic inclusions. Magnetic separation gives good results in ferrous metals recovery. Recovery of non-ferrous metals is also possible. Taking into account high degree of supply of recycled aluminium, other possibilities of usage of bottom ash with relatively high Al content are justified.

Production of hydrogen gas in reaction of Al in bottom ash in alkaline solution could be considered. Bottom ash may also be used as aggregate in concrete but Al reduces its strength. On the other hand, aggregate with metallic Al could be also used in preparation of aerated concrete. Discussion of economic effects and life cycle assessment (LCA) analysis of different methods of recovery or reuse of metals in municipal waste incineration residues is necessary to evaluate their usefulness.

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