Chemical stabilization of municipal solid waste incineration fly ash

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ABSTRACT

The management of municipal solid waste (MSW) incineration fly ash is one of the main problems for MSW incineration plants and an area of research interest due to the high toxicity of fly ash and the amounts produced worldwide. The purpose of this study is the treatment in laboratory scale of the fly ash produced by a MSW incinerator, aiming to its stabilization. Firstly, a detailed characterization of fly ash, which involves both its physicochemical properties and its leaching behavior, was conducted. Fly ash was classified as hazardous waste according to Council Decision 2003/33/EC, using the European standard leaching test EN 12457/2. Two techniques, phosphoric acid stabilization and water washing, were used for the treatment of fly ash, in order to produce a stabilized fly ash that fulfills the criteria for disposal in a non-hazardous waste landfill. The effect of various parameters was investigated, such as phosphoric acid to ash ratio, pH, the sequence of the two processes and different phosphate sources. The chemical stabilization process with phosphoric acid effectively stabilizes fly ash, while water washing process effectively removes salts from fly ash. The combination of the two processes revealed the problematic mobilization of some toxic metals in specific changes of processes. A successful combination of the two techniques was found regarding the effective fly ash stabilization and the production of a less polluted wastewater. This method was also tested for the treatment of a fly ash sample produced by a medical waste incinerator, and the results indicate that this method successfully stabilizes medical waste incineration fly ash as well.

Keywords: municipal solid waste, medical waste, incineration, fly ash, chemical stabilization, phosphoric acid, water washing, leaching test