

Toxicity Mitigation and Solidification of Municipal Solid Waste Incinerator Fly Ash Using Alkaline Activated Coal Ash

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Municipal solid waste incineration (MSWI) is a common and effective practice to reduce the volume of solid waste in urban areas. However, the byproduct of this process is a fly ash (IFA), which contains large quantities of toxic contaminants. The purpose of this research study was to analyze the chemical, physical and mechanical behaviors resulting from the gradual introduction of IFA to an alkaline activated coal fly ash (CFA) matrix, as a mean of stabilizing the incinerator ash for use in construction applications. IFA and CFA were analyzed via X-ray fluorescence (XRF), X-ray diffraction (XRD) and Inductive coupled plasma (ICP) to obtain a full chemical analysis of the samples, its crystallographic characteristics and a detailed count of the eight heavy metals contemplated in US Title 40 of the Code of Federal Regulations (40 CFR). The particle size distribution of IFA and CFA was also recorded. EPA's Toxicity Characteristic Leaching Procedure (TCLP) was followed to monitor the leachability of the contaminants before and after the activation. Also images obtained via Scanning Electron Microscopy (SEM), before and after the activation, are presented. Concrete made from IFA, CFA and IFA-CFA mixes was subjected to a full mechanical characterization; tests include compressive strength, flexural strength, elastic modulus, Poisson's ration and setting time. The toxicity of IFA was considerably reduced using this technique. This technology could provide an efficient, cost-effective and environmentally friendly solution to IFA disposal by reducing its toxicity levels and allowing it to be re-classified as a non-hazardous material.

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