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## **UTILIZATION OF MUNICIPAL SOLID WASTE INCINERATOR FLY ASH IN CEMENT MORTARS**

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Disposal of municipal solid waste has become a major problem in many countries around the world. With the benefits of substantial weight and volume reduction and potential energy recovery, incineration has become a promising municipal solid waste (MSW) management option. Despite the fact that incineration reduces volume and mass of the wastes by as much as 80%, there are still residues to be properly managed. This research is aimed at evaluating the potential of different types of MSWI fly ash from an incineration facility to be used in cement mortars by using existing standard test methods for cement and coal fly ash.

Two types of MSWI fly ash samples: chemically treated and untreated fly ashes, were used. The treated fly ash was used to replace fine aggregates while the finer untreated fly ash was used to directly replace cement in mortars. Fractionation by air classification was introduced to separate the raw untreated fly ash into fine and coarse fractions to improve usability. MSWI fly ash, in its raw and fractionated forms, has been characterized with a view to utilizing the material to replace part of portland cement in mortars. Characterization involved chemical and physical analyses, observation under Environmental Scanning Electron Microscope (ESEM), and X-ray fluorescence (XRF) and X-ray Diffraction (XRD) analyses.

Results showed that both raw and fractionated fly ashes significantly enhanced compressive strengths of mortar specimens. Attempts were also made to specify the sources of the additional strength by microstructural examination as well as XRD analyses of the hydration products of MSWI fly ash-cement mortar pastes. A new chemical phase was identified exclusively in the MSWI fly ash-cement paste. High absorption capacity of the fly ashes and the formation of  $C_3A.CaCl_2.10H_2O$  were responsible for the superior strength properties. Toxicity Characteristic Leaching Procedure (TCLP) tests were performed on these specimens to assess the likelihood of heavy metals being released into the environment. The benefits of using MSWI fly ash in mortar are twofold; namely, the cost savings stemming from reduction in the cement used, and the ecological advantage of ensuring a final destination for the ash.