

Effects of metakoalin on municipal solid waste incineration (Mswi) bottom ash-cement composite

Abstract

Municipal solid waste incinerators (MSWI) produce by products which can be classified as bottom and fly ashes. The bottom ash (BA) accounts for 85-90% of solid product resulting from municipal solid waste combustion. The objective of this study was to assess the feasibility of municipal solid waste incineration bottom ash as a supplementary cementations material for the preparation of blended cement. The used of bottom ash as a research material is because of substances contained in bottom ash which is almost same with cement. X-Ray Fluorescence (XRF) spectroscopy analysis was used to determine chemical compositions of the BA and metakoalin (MK) used in this study. Five series of concrete mix design had been examined which contained different percentage of bottom ash and metakaolin as partial replacement for cement in concrete mixes by volume. A few test such as workability, water absorption, and compression test were carried out to investigate properties of grade 20 concrete incorporating bottom ash and metakaolin. The concrete cubes were tested at age of 7 and 28 days to study the development its compressive strength. Concrete mix design with 10% BA and 10% MK shows the highest strength of 32.9 MPa and surpassed strength 20 MPa. Bottom ash was found to have some reactivity, but without greatly affecting the hydration process of Ordinary Portland cement (OPC) at 10% replacement with 10% metakaolin is required to be used in the production of concrete in order to improve strength.

Keywords

Cement; Concrete strength; Metakoalin; Municipal solid waste incineration bottom ash