

Hydration of the combinations of ground granulated blast furnace slag cements

ABSTRACT

The heat of hydration is known as a measurement of the initial chemical reactions for the hydration of cement. The heat liberated during the hydration process affects the temperature rise in concrete, which may cause an early-age thermal cracking of a concrete structure. To address this thermal cracking issue, Portland cement/ground granulated blast furnace slag (PC/GGBS) is often used, due to the low heat hydration properties of GGBS. This paper presents the results of isothermal conduction calorimetry tests performed on GGBS binary cement, Portland cement/ground granulated blast furnace slag (PC/GGBS), GGBS ternary cement, and Portland cement/ground granulated blast furnace slag/metakaolin (PC/GGBS/MK). The tests covered a range of GGBS levels, which are up to 75% GGBS level and up to 15% MK content by mass for the ternary cement combinations. For PC/GGBS cement, the total heat of hydration is lower than that of PC, and an increase in the GGBS levels resulted in a decrease in the amount of heat liberated; however, for PC/GGBS/MK, the heat of hydration generated is lower than that of PC but is greater than those of the equivalent PC/GGBS, which has an equivalent PC content.

Keyword: Ground granulated blast furnace slag; Metakaolin; Heat of hydration; Binary; Ternary