

Mechanical properties variations of expandable foam grout containing various alkali-free accelerator contents

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ABSTRACT

Expandable foam grout (EFG) is a cementitious mixture that represents characteristics of high flowability, volume expansion, and relatively low long-term strength. Typically, the EFG mixtures contain water, cement, bentonite, aluminum powder, and an alkali-free accelerator. Aluminum powder induces volume expansion of EFG mixtures through chemical reactions with cement paste, which results in hydrogen gas generation in the cement paste. Subsequently, the gas retention establishes a porous structure as the mixture loses its flowability by cement hydration (i.e., cement setting). The alkali-free accelerator plays a critical role in the activation of cement hydration depending on the accelerator contents. Therefore, it is important to evaluate effects of the contents of the accelerator contents on volume expansion and strength of EFG mixtures because the hydration rates affect the characteristics. This study experimentally observed the evolution of expansion ratio and compressive strength of EFG mixtures with various contents of the accelerator. The results shows that the expansion ratio and compressive strength decrease with an increase in the contents of the accelerator, partly due to the shortened setting time. Based on the results, a relationship between the accelerator content in EFG mixtures and their mechanical properties was established. Furthermore, the relationship between the volume expansion and compressive strength was introduced.

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