

Use of tungsten mine sludge waste in the mitigation of internal expansive reaction

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T 61

ABSTRACT

The degradation of concrete structures by the internal expansive reactions (IER), which include the alkali-silica reaction (ASR) and the internal sulphate reaction (ISR) related with delayed ettringite formation (DEF), are two of the major problems that nowadays affect several concrete structures in the world. Therefore, it is essential to find preventive methods to inhibit the appearance of these reactions in new concrete structures.

This research work aims to investigate the effectiveness of tungsten sludge from a Portuguese mine in the inhibition of IER and is part of an extensive study to elucidate the role that the mineral additions have in the mechanism of inhibition of IER in concrete.

For this purpose several concrete mixes were produced by using tungsten sludge as a partial cement replacement.

The results of accelerated expansion tests and microstructural evolution of the concretes show that the incorporation of 30% of tungsten sludge as cement replacement appears to be effective in the mitigation of ASR and ISR.

KEYWORDS

Alkali-silica reaction; internal sulphate reaction; mineral additions; mitigation; tungsten mine sludge

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