



METHODS OF MITIGATING ALKALI REACTIVITY OF GRAVEL AGGREGATE

SPOSOBY OGRANICZENIA REAKTYWNOŚCI KRUSZYWA ŻWIROWEGO

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Abstract

Effectiveness of selected chemical admixtures and mineral additives to mitigate alkali-silica reaction was compared based on reactive gravel aggregate. Lithium compounds in the form of nitrate and lithium polysilicate were used as chemical admixtures. Natural pozzolans containing zeolite were used as mineral additive. Efficiency of the additive was enhanced by modification with ammonium ions. Linear changes of mortars with crushed gravel aggregates were studied with the accelerated and long-term methods. Additionally, scanning electron microscopy was used for microstructural observations. It was demonstrated that at elevated temperatures the application of lithium compounds provided better protection. Under conditions similar to those in the field, 20-30% of natural pozzolans proved to be more effective in inhibiting the expansion. Regardless of the method of protection applied, the presence of alkali-silica reaction products was detected in the microstructure of the mortars.

Keywords: alkali-silica reaction, lithium compounds, natural pozzolana, zeolite, expansion, reaction inhibition

Streszczenie

Na przykładzie reaktywnego kruszywa żwirowego porównano efektywność ograniczenia reakcji alkalia-kruszywo przy pomocy wybranych domieszek chemicznych i dodatków mineralnych. Jako domieszki chemiczne zastosowano związki litu w postaci azotanu i polikrzemianu litu. W przypadku dodatków mineralnych zastosowano naturalną pucolanę, zawierającą zeolit, której efektywność zwiększono poprzez modyfikację jonami amonowymi. Wykonano badania zmian liniowych zapraw z rozdrobnionym kruszywem żwirowym metodą przyspieszoną i długoterminową. Dodatkowo wykonano obserwacje mikrostruktury z wykorzystaniem elektronowego mikroskopu skaningowego. Wykazano, że w warunkach podwyższonej temperatury lepsze zabezpieczenie uzyskano po zastosowaniu związków litu. W warunkach zbliżonych do eksploatacyjnych zastosowanie 20-30% pucolany naturalnej skuteczniej hamowało ekspansję zapraw z kruszywem reaktywnym. Niezależnie od sposobu zabezpieczenia, w mikrostrukturze zapraw wykryto obecność produktów reakcji alkalia-krzemionka.

Słowa kluczowe: reakcja alkalia-krzemionka, związki litu, pucolana naturalna, zeolit, ekspansja, inhibicja reakcji

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