



THE INFLUENCE OF TOTAL WATER-TO-CEMENT RATIO ON THE MECHANICAL PROPERTIES OF CEMENTITIOUS COMPOSITES INTERNALLY CURED WITH POLYACRYLIC SUPERABSORBENT POLYMERS (SAP)

WPŁYW CAŁKOWITEGO WSPÓŁCZYNNIKA WODA-CEMENT NA WŁAŚCIWOŚCI MECHANICZNE KOMPOZYTÓW CEMENTOWYCH PIELĘGNOWANYCH WEWNĘTRZNIE POLIAKRYLOWYMI POLIMERAMI SUPERABSORPCYJNYMI (SAP)

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Abstract

Superabsorbent polymers (SAP) allow for the introduction of changes to the pore network characteristics in cementitious composites and the course of binder hydration. Therefore, SAP addition contributes to significant changes in multiple properties of concrete. The effect of internal curing differs depending on its design process – the initial content of curing water in the concrete mix, polymer characteristics and water absorption properties, the state in which it's added (non-saturated/hydrogel), and the design method regarding curing water content in the entire water content. The authors investigated those variables' influence on selected concrete properties – compressive strength, water absorption, and shrinkage. All independent variables significantly influenced the studied properties of concrete. The increase in the total water-to-cement ratio led to a significant decrease in the mechanical properties of cementitious composites. Modification with the use of SAP added in the form of hydrogel had the most positive influence on the properties of concrete..

Keywords: concrete internal curing, superabsorbent polymers, cementitious composites, hydrogel, SAP

Streszczenie

Polimery superabsorpcyjne (SAP) umożliwiają wprowadzenie zmian w charakterystyce sieci porowej kompozytów cementowych i w przebiegu hydratacji spoiwa. W efekcie dodatek SAP przyczynia się do znaczących zmian w wielu właściwościach betonu. Efekt pielęgnacji wewnętrznej różni się w zależności od metody jej zaprojektowania – początkowej zawartości wody pielęgnacyjnej w mieszance betonowej, właściwości fizycznych polimeru, w tym zdolności do absorpcji wody, stanu, w jakim jest on wprowadzony (nienasycony wodą/hydrożel), oraz metody uwzględnienia wody pielęgnacyjnej w całej zawartości wody zarobowej. Autorzy zbadali wpływ tych zmiennych na wybrane właściwości betonu, w tym na wytrzymałość na ściskanie, nasiąkliwość i skurcz całkowity. Wszystkie zmienne niezależne w istotny sposób wpływały na badane właściwości betonu. Wzrost całkowitego współczynnika woda-cement spowodował istotne pogorszenie właściwo-

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ści mechanicznych kompozytów cementowych. Najbardziej pozytywnym wpływem na właściwości betonu charakteryzowała się modyfikacja za pomocą dodatku SAP wprowadzonego w postaci hydrożelu.

Słowa kluczowe: pielęgnacja wewnętrzna betonu, polimery superabsorbpcyjne, kompozyty cementowe, hydrożel, SAP

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