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ROZPRAWA DOKTORSKA

OCENA TRWAŁOŚCI BETONÓW NISKOEMISYJNYCH

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ABSTRACT

This dissertation deals with the durability of concretes made of low-carbon cements with a high content of non-clinker main constituents in the composition, with special attention paid to corrosion caused by carbonation process, resistance to chloride ions penetration, potential to protect reinforcing steel against corrosion and resistance to low temperatures (frost resistance). Due to the available resources of raw materials, the most commonly used main components of cement in Poland, apart from Portland clinker (K), are granulated blast furnace slag from the iron metallurgy (S) and silica fly ash from the power industry (V). Limestone (LL,L), commonly available to basically every cement plant, is also gaining wider use [1,2]. Therefore, the research program focused on concretes made of cements with low Portland clinker content (up to 65%) containing the above-mentioned components in binary systems: clinker (K) - slag (S), clinker (K) – fly ash (V), clinker (K) – limestone (LL) and clinker (K)-slag (S) –fly ash (V) and clinker (K) – slag (S) – limestone (LL). The research program also included the physicochemical characteristics of the cement and concrete components used.

The research part of the dissertation was preceded by a literature study, in which the mechanisms of the most common types of concrete corrosion were presented, as well as the influence of individual non-clinker components of the main cements on concrete durability.

On the basis of the obtained results of own research, the durability of low-emission concretes was evaluated with respect to particular types of corrosion (carbonation, chloride ion penetration, corrosion of reinforcing steel, frost resistance). The conducted research has shown that with appropriate material and technological guidelines, it is achievable to shape high durability of low-emission concretes. The main factors turned out to be a sufficiently low water-cement ratio, moisture care of fresh concrete and a sufficiently long curing time. In the case of frost resistance shaping, aeration of the concrete mixture of sufficient quality was crucial.

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