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Photocatalytic Active Surface of LWSCC Architectural Concretes

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Abstract : Current trends in the building industry are oriented towards the reduction of maintenance costs and the ecological benefits of buildings or building materials. Surface treatment of building materials with photocatalytic active titanium dioxide added into concrete can offer a good solution in this context. Architectural concrete has one disadvantage – dust and fouling keep settling on its surface, diminishing its aesthetic value and increasing maintenance e costs. Concrete surface – silicate material with open porosity – fulfils the conditions of effective photocatalysis, in particular, the self-cleaning properties of surfaces. This modern material is advantageous in particular for direct finishing and architectural concrete applications. If photoactive titanium dioxide is part of the top layers of road concrete on busy roads and the facades of the buildings surrounding these roads, exhaust fumes can be degraded with the aid of sunshine; hence, environmental load will decrease. It is clear that options for removing pollutants like nitrogen oxides (NOx) must be found. Not only do these gases present a health risk, they also cause the degradation of the surfaces of concrete structures. The photocatalytic properties of titanium dioxide can in the long term contribute to the enhanced appearance of surface layers and eliminate harmful pollutants dispersed in the air, and facilitate the conversion of pollutants into less toxic forms (e.g., NOx to HNO₃). This paper describes verification of the photocatalytic properties of titanium dioxide and presents the results of mechanical and physical tests on samples of architectural lightweight self-compacting concretes (LWSCC). The very essence of the use of LWSCC is their rheological ability to seep into otherwise extremely hard accessible or inaccessible construction areas, or sections thereof where concrete compacting will be a problem, or where vibration is completely excluded. They are also able to create a solid monolithic element with a large variety of shapes; the concrete will at the same meet the requirements of both chemical aggression and the influences of the surrounding environment. Due to their viscosity, LWSCCs are able to imprint the formwork elements into their structure and thus create high quality lightweight architectural concretes.

Keywords : photocatalytic concretes, titanium dioxide, architectural concretes, Lightweight Self-Compacting Concretes (LWSCC)
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