

Photocatalytic Self-Cleaning Concrete Production Using Nano-Size Titanium Dioxide

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Abstract : The objective of this research is to evaluate the possibility of using nano-sized materials, mainly titanium dioxide (TiO₂), in producing economic self-cleaning concrete using photo-catalysis process. In photo-catalysis, the nano-particles react and dissolve smog, dust, and dirt particles in the presence of sunlight, resulting in a cleaned concrete surface. To-date, the Italian cement company (Italcementi) produces a proprietary self-cleaning cementitious material that is currently used in government buildings and major highways in Europe. The high initial cost of the proprietary product represents a major obstacle to the wide spread of the self-cleaning concrete in industrial and commercial projects. In this research project, titanium dioxide nano-sized particles are infused to the top layer of a concrete pour before the concrete surface is finished. Once hardened, a blue dye is applied to the concrete surface to simulate smog and dirt effect. The concrete surface is subjected to direct light to investigate the effectiveness of the nano-sized titanium dioxide in cleaning the concrete surface. The outcome of this research project proved that the titanium dioxide can be successfully used in reducing smog and dirt particles attached to the concrete when infused to the surface concrete layer. The majority of cleansing effect due to photocatalysis happens within 24 hours of photocatalysis process. The non-proprietary mix can be used in highway, industrial, and commercial projects due to its economy and ease of production.

Keywords : self-cleaning concrete, photocatalysis, Smog-eating concrete, titanium dioxide

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