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Using nano- and micro-titanium dioxide (TiO₂) in concrete to reduce air pollution

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As a crucial element in construction, tunnels, roads, pavements, and more, concrete has become one of the most important materials in the world. At the same time, air pollution, particularly in crowded cities, is increasing mainly due to industrial activity and transportation. Therefore, one possible approach to fight pollution could be the use of smart construction materials. Particularly one possibility is the incorporation of photocatalytically-active nano and micro structures into concrete. Incorporation of titanium dioxide (TiO₂) in roads and pavements could result in the reduction and degradation of various pollutants under ultraviolet radiation. The TiO₂-infused concrete would also maintain its optical characteristics for far longer compared to the traditional concrete mix. This research presents an evaluation of the effect of nano- and micro-TiO₂-incorporated concrete on degradation of organic molecules, as assessed by the concrete's ability to degrade rhodamine B dye. We tested concrete blocks with different concentrations of nano- and micro-TiO₂ included in their structure and which were exposed to sunlight for various periods of time (24, 48, 72, 96, and 168 hrs.). The percentage of nano- and micro-TiO₂ used in this research was 3, 6, 9, 12 and 15% of the cement composition. The results showed good degradation of the rhodamine B dye by both nano- and micro-TiO₂, further showing the potential of this approach towards smart construction materials for environmental applications.

Biography

Hala N Elia has received her Bachelor's degree in Civil and Environmental Engineering from the University of Mosul, Mosul, Iraq in 2002 and the Master's degree in Environmental Engineering from the University of Mosul, Mosul, Iraq in 2005. In 2005, she has joined the Department of Civil Engineering, University of Mosul as a Lecturer. In 2013, she has traveled to Little Rock, Arkansas, United States to complete her PhD Degree in System Engineering in University of Arkansas at Little Rock (UALR) and she aims in her work to reduce the air pollutants by using specific materials in concrete.

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