

## **Reducing Photocatalytic Degradation of Exterior Paint Prepared with TiO<sub>2</sub>**

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Titanium dioxide (TiO<sub>2</sub>) is the most widely used white pigment in the paint industry. TiO<sub>2</sub> is a photocatalyst under ultraviolet (UV) light. When it absorbs UV radiation, a UV photon which overcomes the energy gap between the valence and conduction bands of TiO<sub>2</sub>, creates an electron-hole pair. The hole then reacts with water to produce hydroxyl radicals followed by a series of other reactions that produce more and more hydroxyl radicals which react with the organic matter to form water and carbon dioxide leading to the destruction of the polymeric binder of the paint film. This effect could be reduced by mixing the pigment with an inert oxide such as silica. The current research focuses on reducing photocatalytic effect of TiO<sub>2</sub> and thereby increasing the durability of the paint. A series of emulsion paint samples were prepared according to an exterior paint formulation by varying the ratio TiO<sub>2</sub>:SiO<sub>2</sub>. Formation of photocatalytic oxides were determined by measuring the absorbance using Orange II solution. Samples were exposed to UV radiation by applying them on small watch glasses as thin layers. The solution absorbance values on the samples were measured before and after exposure to UV radiation and recording absorbance at 60 min, 120 min and 240 min. The best sample with the lowest photocatalytic effect was used to determine paint properties. The lowest photocatalytic effect was observed for the sample containing 20% SiO<sub>2</sub> and 80% of TiO<sub>2</sub> and the paint properties were determined for that sample. Most of the properties are comparable with those of the industrial paint. However, viscosity and opacity are significantly reduced. It could be due to the undesired particle size of silica incorporated. Further investigations must be carried out to determine the optimum particle sizes which give the lowest photocatalytic effect with enhanced paint properties.

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