

Boosting Photocatalytic Properties of Self-Cleaning Coatings using an aqueous suspension of Nano TiO₂

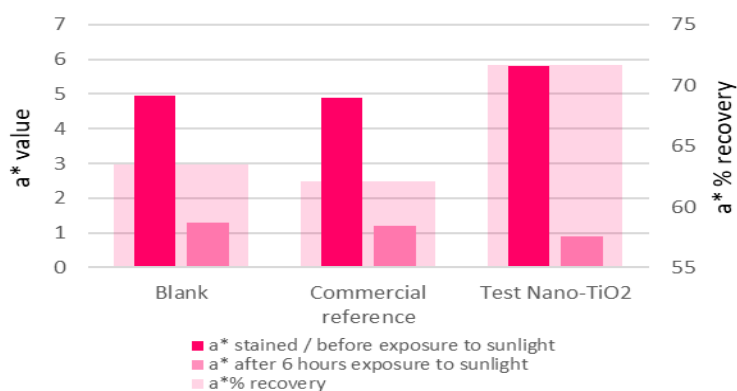
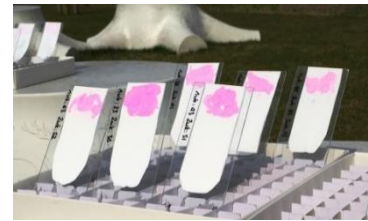
Within the European FP7 project SHYMAN (Sustainable Hydrothermal Manufacturing of Nanomaterials), Promethean has developed a broad range of aqueous nano-suspensions. VLCI has worked on an anatase titanium dioxide nano-suspension and confirmed its excellent photocatalytic property.

From titanium dioxide to photocatalytic properties...

Titanium dioxide exhibits an ambivalent behaviour in the process of UV degradation. It is well-known for functioning as a UV-absorber, which protects the coating binder from early UV degradation, especially in its rutile form. However, interactions between the coating binder and the photo-excited TiO₂ particles can also accelerate the photo-degradation phenomenon. The anatase form of TiO₂ is even more active in promoting oxidative degradation, and therefore, offers more photocatalytic efficiency. Within the nano-range, this effect has been proven to be greatly enhanced, even at very low concentrations. Based on Hansen Solubility Parameters, this nano-TiO₂ was stabilized with a matching dispersant, which makes it now easy to formulate.

What are the benefits related to self-cleaning coatings?

From VLCI's research, the enhanced photocatalytic effect of the nano-TiO₂ suspension from Promethean, was confirmed in various types of coatings. The study below shows the stain recovery (a* from CIE Lab) in a water-based styrene acrylate coatings, at high PCV (±45), containing 0,5% of dry nano-TiO₂. The films were stained with an UV non-oxidable pink dye, that only becomes prone to reaction in the presence of catalytic TiO₂ surfaces. The films were exposed in the sunlight for 6 hours, and a* parameters (before and after exposure) were compared. The recovery of a* is highlighted below, against a commercial reference (blend anatase/rutile), and a blank:



What are the targeted product developments?

The targeted applications are water-based outdoor topcoats, from high to low PVC levels. VLCI can help you implementing it in your formulation, to achieve the desired properties.