THE APPLICATION OF INNOVATIVE PHOTOCATALYTIC NANOCOMPISITE TiO_2-SiO_2 FOR PAINTINGS

JAKUBIČKOVÁ Michaela, BRECKOVA Alice, SUBRT Jan, PETERKA Frantisek, JIRKOVSKY Jaromir, SAZAVSKA Tereza

Technical University of Liberec, Liberec, Czech Republic, EU

Abstract

A deep characterization of photocatalytic efficiency and mechanism is the basis for developing new materials with enhanced properties for air remediation (NOx, VOCs), but also for self-cleaning of surfaces, especially against biological growth (algae, moss, lichens), which is the most critical disease on outdoor surfaces like roofs. In order to extend the photocatalytic efficiency to broader climate conditions, i.e. cloudy weather or indoor applications, new materials should be also active under visible light. Cement based building are widely used indoors/outdoors and can be perfectly used as substrates for photocatalytic paintings. One of the commercial-application problems of current photo-catalysts incorporated into paint is that organic paint binder is destroyed by the products of photo-catalysis. For construction industry and air remediation, the financial aspect of photoactive material also plays an important role. A novel composite photo-catalyst with cost-effective ultrafine nano-silica particles was designed and the international patent WO 2011 /154560 was applied to protect the fundamentals of its composition. Based on that patent the particle size and TiO_2/SiO_2 ratio is further optimized in view of the photo-catalytic efficiency for different areas of application. The evaluation of the basic version proved that the performance of novel composite photo-catalyst just with 5% of photoactive titanium is equal to pure TiO_2 when applied onto the surfaces of common construction materials. Photo-catalytic properties of the novel composite material was tested according to ISO methods for NOx decomposition for self-cleaning as well as for antibacterial effect. The tested photoactive material proved to be mechanically stable during testing and its antibacterial efficiency and the ability to destroy VOC will be also verified.

Keywords: Photo-catalytic, TiO2 layers, antimicrobial activity

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