

Nanocomposites and nanomaterials

The monitoring of photocatalytic activity of TiO₂ coatings

modified by silver nanoparticles

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Titanium dioxide is known for its self – cleaning properties, which were investigated in this research. The aim of this study was monitoring the photocatalytic activity of titanium dioxide coatings and titanium dioxide modified by silver nanoparticles (AgNPs) towards the decomposition of thin fatty acids layers. For this purpose arachidic acid (AA) was chosen as a model pollutant because of two reasons. Firstly, its molecules have an ability to organize in a form of Langmuir layers due to the amphiphilic properties. Therefore, Langmuir – Blodgett monolayers of AA were formed on a water/air interface and subsequently deposited on TiO₂ and AgNPs/TiO₂ coatings. Secondly, its decomposition can be easily observable using AFM and FT-IR techniques.

Fig. 1. The atomic force microscopy images of arachidic acid monolayer on titanium dioxide and titanium dioxide modified by silver nanoparticles before and after 6 minutes of UV illumination.

As expected, titanium dioxide coatings induced the photocatalytic degradation of AA under the UV illumination. However, it was found, that in the presence of AgNPs this process runs faster. The decomposition of AA proceeded through the continuous disappearing of AA layers and without the change in the layer thickness. Received results allowed to conclude about the mechanism occurred during AA photodegradation on both types of coatings.