

## Nanostructured surfaces

### FT-IR and LDI *in situ* study of stearin acid photodegradation on superhydrophilic TiO<sub>2</sub> surface

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In this work we focused on the investigation of mechanism and products of photodegradation of stearic acid adsorbed on mesoporous TiO<sub>2</sub> films, synthesized via low-temperature sol-gel route in the presence of template agents.

The peculiarities of surface relief transformations of thermally treated mesoporous TiO<sub>2</sub> films (350-500°C) were studied using AFM microscopy. The uniform surface of TiO<sub>2</sub> film calcined at 350°C has developed porous structure with mean pore size about 10 nm. The surface relief of TiO<sub>2</sub> films calcined at 400°C and 500°C becomes more complex revealing titanium dioxide crystallization. Hydrophilic properties of the synthesized films were estimated from measurements of the water contact angles. Freshly prepared TiO<sub>2</sub> and TiO<sub>2</sub> thermoactivated at 400°C characterized by contact angle ca. 23°; 450°C – 17 and films calcined at 500°C on glass showed highly hydrophilic properties, their water contact angles being ca. 5–7°. Under UV illumination, all the TiO<sub>2</sub> films prepared exhibited hydrophilicity with water contact angle of 0°.

Photocatalytic process efficiency was estimated by FT-IR-spectroscopy as a rate of disappearance of the peak at 2957.5 cm<sup>-1</sup> as a function of irradiation time. Products of stearic acid degradation were identified by LDI mass-spectrometric measurements. After 15 min of irradiation in positive as well as in negative mode grows of quantity and intensity of SA peaks were observed. In the field of m/z 428, 656, 911, 1186 groups of peaks belonging to SA associate desorption from superhydrophilic TiO<sub>2</sub> surface were registered. These results agree with our data about TiO<sub>2</sub> films wettability. Under UV illumination, all the used films exhibited hydrophilicity with water contact angle of 0°, that give rise of hydrophobic fat acid molecules selfassociation and their active desorption from the hydrophilic surface. Than all these peaks diminished and intermediate products of SA degradation process appear simultaneously with decreasing of peaks of the asymmetric and symmetric C–H stretching modes of the CH<sub>2</sub> group in the FT-IR spectra.

Prepared films have great potential for applications in LDI spectroscopy as substrates (wafers) with variable hydrophilic properties.