The synthesis of porous nano-TiO_2 films on the basalt fibers

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The use of nanotechnology offers new capabilities to produce innovative materials for targeted properties, giving them a range of new applications. The photocatalytic properties of TiO_2 used to modify the textile materials provide the huge potential application [1,2]. In order to increase the photocatalytic efficiency the smooth TiO_2 films may be replaced by porous TiO_2 coatings [3,4].

TiO_2 was prepared in sol-gel technique using titanium isopropoxide, isopropanol and hydrochloric acid. To the modification of TiO_2 - two surfactants hexadecyltrimethylammonium bromie (CTAB) and poly (ethylene glycol) - block-poly (propylene glycol) - block-poly (ethylene glycol) (BLOK) were used. The basalt fibers (diameter 15.2±0.5 µm) with high thermal resistance were used. TiO_2 sol was deposited on the basalt fibers by dip – coating technique. Than the fibers were calcined to obtain photocatalytically active structure – anatase. The form of TiO_2 – anatase was confirmed using Raman spectrometer Renishaw InVia. The characteristics of TiO_2 coatings on basalt fibers using Scanning Electron Microscope Vega 3 Tescan equipped with X-ray microanalyzer EDS INCA Energy and Atomic Force Microscopy Solver P47 NT-MDT were made. The modified fibers surface and the results of Raman analysis are shown on the Fig.1.

The proposed solution allows to obtain porous TiO_2 films. As a consequence it caused an increase in the surface area of the photocatalyst compared to smooth TiO_2 film.

References

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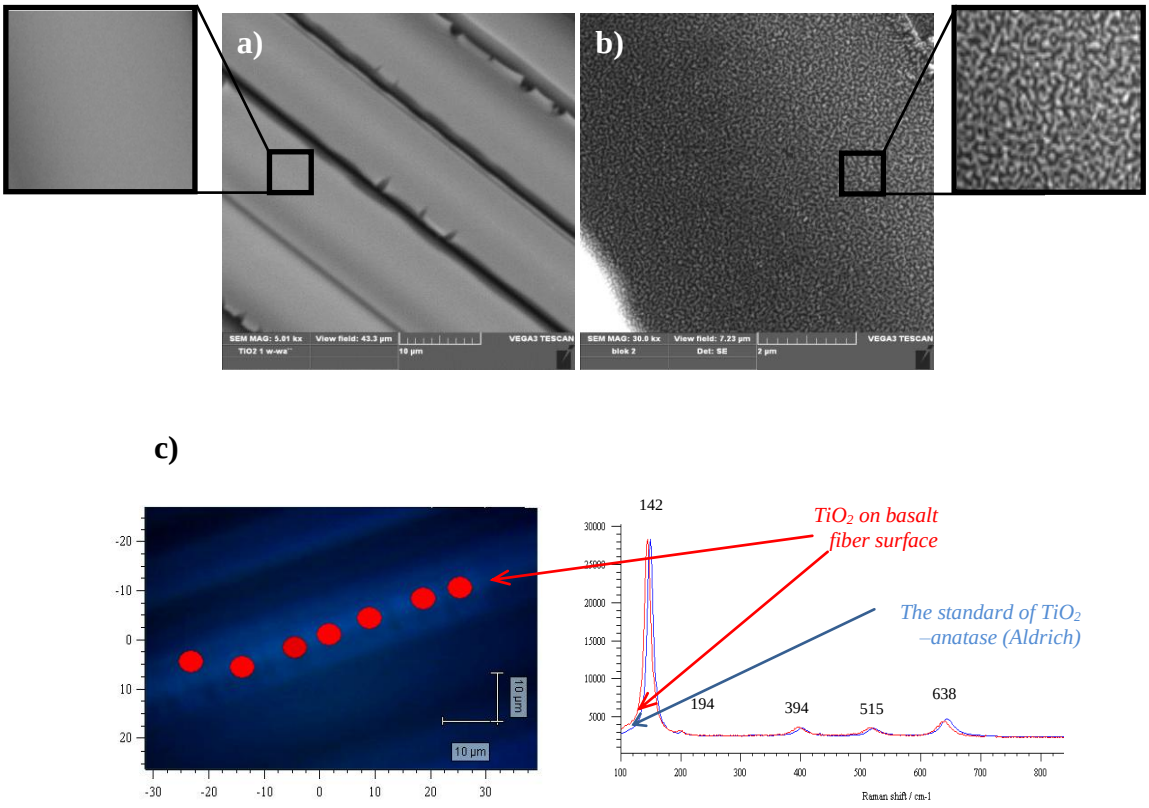

Fig. 1 The basalt fibers modified with TiO_2 a) smooth film, b) porous film (BLOK), c) Raman map and spectrum of modified fibers.

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