The 3rd International Conference on the Physics of Optical Materials and Devices

BOOK OF ABSTRACTS

Editors: **Dr. Miroslav Dramićanin**
Dr. Bruno Viana

Publisher: **Agencija FORMAT, Belgrade**

Print run: **250 copies**

ISBN: **978-86-7306-116-0**

August 2012, Belgrade, Serbia

ICOM 2012

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Belgrade, Serbia
September 3rd – September 6th, 2012

THE OPTICAL PROPERTIES OF DOPAMINE-TiO_2 SUBMICRONIC SIZED PARTICLES

Ivan Dugandžić[a], Dragana Jovanović[b], Lidija Mančić[a], Zoran Šaponjić[b], Jovan Nedeljković[b], Olivera Milošević[a]

[a] *Institute of Technical Sciences of SASA, Knez Mihailova 35/IV, 11000, Belgrade, Serbia, ivan.dugandzic@itn.sanu.ac.rs*
[b] *Laboratory for Radiation Chemistry and Physics, Vinča Institute of Nuclear Sciences, Belgrade University, P.O. Box 522, 11001 Belgrade, Serbia*

It is highly desirable to induce significant red-shift in the optical absorption edges of TiO_2 phases so that this class of low-cost and environmentally friendly materials can be used as effective optical absorbing materials in photovoltaic cells. This work focuses on studying the formation of charge transfer (CT) complex, between TiO_2 surface and dopamine as surface modifier, that induced significant red-shift of optical absorption in comparison to unmodified TiO_2 particles. For that purpose, the submicronic sized TiO_2 particles were synthesized at 150 ^{0}C by means of ultrasonic spray pyrolysis route using two different approaches for powder processing differing on how the precursor solution was made. In the first one, the colloidal source solution of unmodified TiO_2 nanoparticles was used as precursor solution and the particles were additionally modified by dopamine after completing the synthesis procedure. In the second approach, the dopamine modification of source colloidal TiO_2 nanoparticles preceded to powder processing. From Transmission Electron Microscopy (TEM) and Scanning Electron Microscopy (SEM) images it can be concluded that both groups of dopamine modified submicronic spheres have diameter of approximately 430 nm and contain small primary building units (Figure 1a and 1b). The surface structure and optical properties of resulting particles were analyzed using Fourier Transform Infrared (FT-IR) and UV-Vis spectroscopy investigations. The FT-IR measurements show that dopamine successfully formed CT complex at TiO_2 surface. Based on the significant red shift on diffusive reflectance spectra (Figure 1c) it was estimated the effective band-gap value for all observed samples as to be ~1.3 eV.

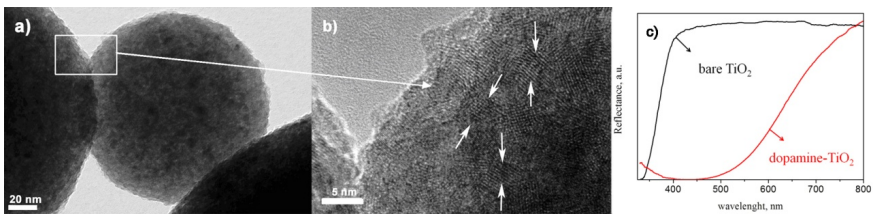

Figure 1. TEM images of: a) TiO_2 particles obtained at 150 ^{0}C, b) marked region at a higher magnification; and c) diffusive reflectance spectra of unmodified (bare) TiO_2 and dopamine modified TiO_2 submicronic sized particles