



**“Gheorghe Asachi” Technical University of Iasi, Romania**



---

## HYDROTHERMAL SYNTHESIZED TiO<sub>2</sub> BASED NANOPOWDERS FOR PHOTOCATALYTIC APPLICATIONS

**Adrian Mihail Motoc<sup>1\*</sup>, Radu Robert Piticescu<sup>1</sup>, Radu Adrian Carcel<sup>2</sup>  
Anca Duta<sup>2</sup>, Oana Raita<sup>3</sup>**

<sup>1</sup>National Research and Development Institute for Non-Ferrous and Rare Metals, 102 Biruintei Blvd., 077145 Pantelimon, Ilfov, Romania

<sup>2</sup>Transylvania University of Brasov, 29 Eroilor Blvd., 500036 Brasov, Romania

<sup>3</sup>National Institute for Research and Development of Isotopic and Molecular Technologies, 65-103 Donath Str., 400293 Cluj-Napoca, Romania

---

### Abstract

Hydrothermal synthesis was used to obtain nanostructured TiO<sub>2</sub> based nanopowders. There were prepared pure and ZrO<sub>2</sub> doped compositions consisting mainly of anatase phase with crystallite size up to 20 nm. The agglomerates of the as-synthesized materials had dimensions ranging from a few hundreds nanometers to 200 microns. The investigations concerning the thermal behavior revealed the presence of an exothermal effect at around 550°C which could indicate a possible phase transformation of anatase to rutile but further studies are required. The photocatalytic properties of the TiO<sub>2</sub> hydrothermal nanostructured powders were evaluated in a photoreactor under UV ( $\lambda_{\max} = 365$  nm) irradiation using methylene blue dye and the effect of H<sub>2</sub>O<sub>2</sub> on the photocatalytic efficiency was tested. The results may be attributed to the presence of free radicals and holes generated in the anatase nanostructure evidenced by EPR spectra of nanopowders.

*Key words:* hydrothermal synthesis, photocatalysis, TiO<sub>2</sub> based nanostructured powder

*Received:* April, 2011; *Revised final:* September, 2011; *Accepted:* September, 2011

---

---

\* Author to whom all correspondence should be addressed: e-mail: [amotoc@imnr.ro](mailto:amotoc@imnr.ro); Phone +40213522048; Fax +40213522048