



národní  
úložiště  
šedé  
literatury

## **Sol-Gel Derived Au-Enriched TiO<sub>2</sub> and TiO<sub>2</sub>-ZrO<sub>2</sub> Photocatalysts and Their Examination in Photocatalytic Reduction of Carbon Dioxide**

Matějová, Lenka  
2013

Dostupný z <http://www.nusl.cz/ntk/nusl-155848>

Dílo je chráněno podle autorského zákona č. 121/2000 Sb.

Tento dokument byl stažen z Národního úložiště šedé literatury (NUŠL).

Datum stažení: 04.05.2024

Další dokumenty můžete najít prostřednictvím vyhledávacího rozhraní [nusl.cz](http://nusl.cz).

## Sol-gel derived Au-enriched TiO<sub>2</sub> and TiO<sub>2</sub>-ZrO<sub>2</sub> photocatalysts and their examination in photocatalytic reduction of carbon dioxide

L. Matějová<sup>1,3</sup>, M. Reli<sup>1</sup>, L. Čapek<sup>2</sup>, V. Matějka<sup>1</sup>, O. Šolcová<sup>3</sup>, L. Obalová<sup>1</sup>, K. Kočí<sup>1</sup>

<sup>1</sup>VŠB-Technical University of Ostrava, Czech Republic;

<sup>2</sup>University of Pardubice, Czech Republic;

<sup>3</sup>Institute of Chemical Process Fundamentals of the ASCR, v. v. i., Czech Republic

[lenka.matejova@vsb.cz](mailto:lenka.matejova@vsb.cz), [matejova@icpf.cas.cz](mailto:matejova@icpf.cas.cz)

Since Fujishima and Honda in 1972 reported in Nature on the electrochemical photolysis of water at a semiconductor electrode [1], namely the split water into hydrogen and oxygen in the presence of TiO<sub>2</sub> electrode under VUV light irradiation, the scientific interest in the heterogeneous photocatalysis over semiconductors has dramatically raised. From the group of semiconductors TiO<sub>2</sub> has been stood in the forefront of scientific research. Researches have started keenly investigate the positive effect of various forms (i.e. nanoparticulate powders and thin films) of TiO<sub>2</sub> for various applications, e.g. degradation of organic pollutants in air and water, sensing films of gas sensors, coatings for self-cleaning surfaces, an electrode material or a support of noble metal catalysts. The development of highly efficient TiO<sub>2</sub>-based photocatalysts, which would be reactive even under solar light irradiation, has become a challenge and a subject of current intense research.

Considering the aspects of preparation of gold-based photocatalysts and gold photocatalysis, it is worth a mention that it is more complicated issue than in the case of other noble metals due to the gold crystallinity. In this contribution some critical aspects of the gold photocatalysis will be discussed. Au-supported TiO<sub>2</sub> and TiO<sub>2</sub>-ZrO<sub>2</sub> photocatalysts and their pristine counterparts were prepared by using the sol-gel process controlled within reverse micelles environment and by impregnation under vacuum. All photocatalysts were characterized by organic elementary analysis (OEA), inductively coupled plasma mass spectrometry (ICP MS), N<sub>2</sub> physisorption, powder X-ray diffraction (XRD), transmission electron microscopy combined with electron diffraction (TEM/SEAD) and UV-Vis spectroscopy. The performance of laboratory-prepared photocatalysts was examined in CO<sub>2</sub> photocatalytic reduction and was compared with the catalytic performance of commercial TiO<sub>2</sub> Evonic P25. Logically, the determined physicochemical and optical properties of photocatalysts were correlated with their catalytic performance and some interesting aspects of gold photocatalysis were revealed.

### Acknowledgements:

This work was supported by the project "Opportunity for young researchers", reg. no. CZ.1.07/2.3.00/30.0016, supported by Operational Programme Education for Competitiveness and co-financed by the European Social Fund and the state budget of the Czech Republic and the EU project "Energy units for utilization of non traditional energy sources", reg. no. CZ.1.05/2.1.00/03.0069.

### References:

[1] A. Fujishima, K. Honda, Nature 238 (1972) 37-38.

**Keywords:** TiO<sub>2</sub>, TiO<sub>2</sub>-ZrO<sub>2</sub>, gold, photocatalysis, carbon dioxide