Improving of Photocatalytic TiO_2 Nanopowders Efficiency and Their Potential Applications

Tsisana Gavasheli[a] *G. Mamniashvili*[b] *T. Gegechkori*[b] *M. Nadareishvili*[b] *T. Zedginidze*[b]

e-mail: tsismari.gavasheli@tsu.ge

[a] Electrical and Electronics Engineering Department,
Faculty of Exact and Natural Science, TSU,
1,I.Chavchavadze Ave., 0179

[b] TSU Andronikashvili Institute of Physics,
6 Tamarashvili, 0177

Currently the consumption of gas and fuel resources on the Earth will be soon exhausted. It is not possible to slow down this process, the only way out is finding of the alternative energy sources: the most perspective direction on this way is water dissociation into hydrogen and oxygen using solar energy and utilization of produced hydrogen as fuel, the final product of which under burning is again water. Nowadays a topical problem is the increase of efficiency of the photocatalytic reaction. By this we mean the dissociation of water into hydrogen and oxygen by using the solar ray energy and photocatalysts. Photocatalysis is initiated by the absorption of photon by semiconductor oxide TiO2. The resulting energy is equal to or greater than the band gap of the semiconductor (3.2 eV for TiO2), which produces electron – hole pairs. The low-temperature chemical method to coat powders by different sized material nanoclusters (magnetic metals and silver) was developed by our group. The peculiarity of the method is in the maintaining of low temperature during the deposition reaction (58–60oC). The novelty of our work is in the investigation of optical properties of TiO2 powders coated with Ni-B and Ag nanoclusters by the above-mentioned unique method and improvement of their photocatalytic properties by increasing visible light share in the photocatalytic process, what improves the photocatalysis reaction efficiency. We suggest methods for the improvement of optical properties of TiO2 nanopowders: our original methods of cluster coating, vacuum treatment, choosing of optimal sizes, to apply to TiO2 nanotubes and study the possible increase of the absorption of visual part of solar radiation by these objects (fig1).

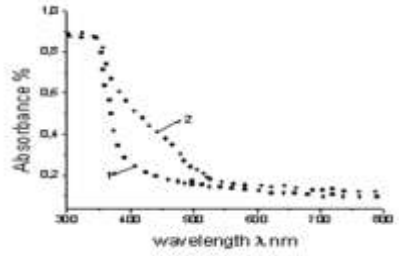

Figure 1. The absorption spectra before the heat vacuum treatment and after it for TiO_2 (anatase) coated with Ni-B clusters.

References

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