

Physico-chemical nanomaterials science

Semiconductor dye-polymer films as photocatalysts

O. Nadтока¹, O. Linnik², N. Shestopal², N. Smirnova²

*¹Department of Macromolecular Chemistry, Taras Shevchenko National University of Kyiv, Volodymyrska Street, 64/13, 01601, Kyiv, Ukraine.
E-mail: oksananadtoka@ukr.net*

²Chuiko Institute of Surface Chemistry, National Academy of Sciences of Ukraine, General Naumov Str., 17, 03680, Kyiv, Ukraine

1 Solar cell investigation is focused on the research of new materials or combinations of materials and optimization of device design. The low-cost and non-toxic semiconductor materials based on titania are perspective in utilization of solar energy in the process of soil and water purification as well as photovoltaic materials research. The challenge is therefore to extend the sensitivity of TiO₂ towards the visible range of the spectrum by modifying of TiO₂ with inorganic ions (metal or/and nonmetal) [1] or organic compounds (dyes).

2 The semiconductive films contained 10 and 30 % of TiO₂ in titania/silica nonocomposite were synthesized by sol-gel method using concentrated anatase titania colloid [3]. Acridine Yellow (AY) was adsorbed onto the surface from its aqueous solution. An optimal concentration of AY for the adsorption experiments was found. The film with adsorbed AY was covered by polyepoxypropyl carbazole (PEPC) dissolved in benzene.

3 The semiconductor dye-polymer composites were tested for the stability in several solvents (water, ethanol/water mixtures and pure ethanol). The amount of adsorbed AY as well the concentration of PEPC influenced on the level of desorbed AY from the composites.

Photocatalytic performance in the process of dichromate ions reduction and tetracycline degradation under UV and visible light was performed. Among tested materials, the most perspective photocatalytic system was the composite containing 10% TiO₂/SiO₂//AY//PEPC.

1. O. Linnik, N. Shestopal, N. Smirnova, A. Eremenko, at all. Correlation between electronic structure and photocatalytic properties of non-metal doped TiO₂/ZrO₂ thin films obtained by pulsed laser deposition method //Vacuum. - 2015 - [114](#). – P. 166–171.