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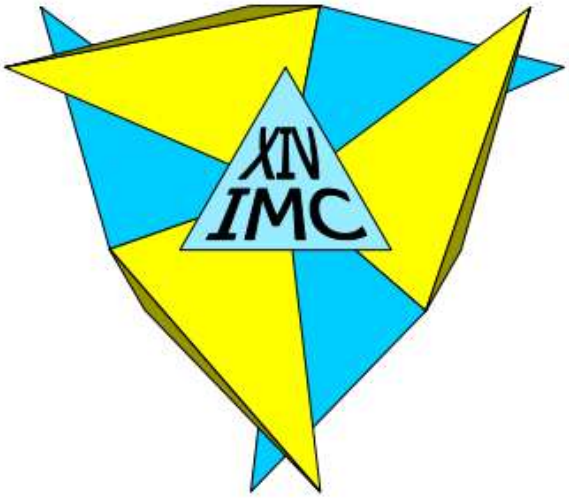

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SENSITIZATION OF TITANIUM DIOXIDE WITH AN ANIONIC POLYMETHINE DYE IN THE PHOTOCATALYTIC REDUCTION OF METHYLENE BLUE

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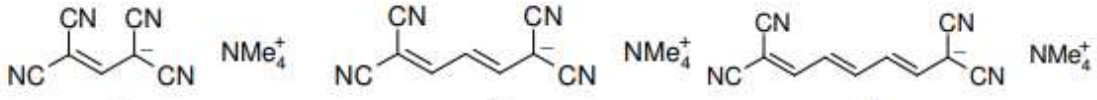
Photocatalysis has attractive prospects for solar energy conversion, environmental protection, registration and reproduction of information, *etc*. But, to satisfy the requirements, the highest quantum yields of the photocatalytic processes involving known photocatalysts, in particular TiO_2, are not sufficient. Therefore, one of the most important challenges in photocatalysis is the creation of highly efficient photocatalytic systems, and finding opportunities for their practical application.

A perspective method that can increase the photocatalytic activity (PA) consists in constructing heterostructures (HS) containing microparticles of a semiconductor photocatalyst and a dye-sensitizer (D), which is attached to the surface of a film of electron-permeable material (P). HS of this type are active in the photocatalytic processes of decomposition of water and oxidation of iodide ions. It is important to determine the general nature of this approach to create efficient light systems and evaluate the possibility of using it to create sensitized photocatalytic blocks, using other dyes as block components. For this purpose we synthesized new HS based on TiO_2 and anionic polymethine dyes, and investigated them in the photocatalytic process of restoring methylene blue (MB). To obtain the HS we used anionic polymethine dyes 1-3, titanium dioxide and as polymer polyepoxypropylcarbazole. The PA of the HS P/D/TiO_2 was evaluated for speed bleaching of a solution of MB formaldehyde.



The studies of the effect of the HS on the process of photoreduction of MB showed that the HS behave differently, depending on which spectral area of light is used for the photoexcitation. During irradiation of the reaction mixture with visible light, the light was absorbed by the dye sensitizer, which is part of HS, and MB, which is in the solution. The restoration of MB is the result of the photocatalytic activity of HS. Research has shown that on replacing P/D/TiO_2 by TiO_2 a similar reaction does practically not take place under the same conditions. In the systems containing HS with increasing contents of dye, PA initially increases and then, having reached a certain threshold, is reduced. A completely different dependence of the activity on the quantitative composition of the HS is observed if the system is irradiated with ultraviolet light, which is absorbed, mainly, by the titanium dioxide. The highest activity was observed for the original sample that did not contain any dye-sensitizer.

In conclusion, we have created a new heterostructure, consisting of titanium dioxide, polymethine dye-sensitizer and polymers, which is sensitive to light of the visible spectral area.