



The simplest cell is a sandwich-like structure composed of two electrodes and the iodide-containing electrolyte. Both electrodes are made of the electroconducting glass plates. The anode is placed on the top of the cell and it should have a layer of the  $\text{TiO}_2/\text{dye}/\text{polyethylenepolycarbonate}$  ( $\text{TiO}_2/\text{D}/\text{PEPC}$ ) heterostructure located underneath in order to supply the light-generated excited electrons.

It has been proven that the photocatalytic reduction of methylene blue inside the synthesized heterostructures is induced by the light absorbed with the dye-sensitizer. However, photocatalytic activity of the material significantly depends on the dye content. Photoexcitation of the dye-sensitizer occurs under irradiation of the heterostructure with light with a wavelength  $\lambda > 400$  nm. The photocatalytic activity shows initial increase followed by gradual lowering in all cases. Methylene blue reduces by  $\text{TiO}_2/\text{D}/\text{PEPC}$  under irradiation with light with  $\lambda > 400$  trough light absorption by the dye. Increase in the photocatalytic activity with content of the dye in the heterostructure seems quite expected and natural as a number of the excited molecules participating in the photocatalytic transformation rises with the dye concentration. Further decrease in photocatalytic efficiency of the materials occurred at massive application on the semiconductor surface can be caused by lower efficiency of the dye/semiconductor interaction that results in lesser probability of the excited electrons capturing in the conductivity band. This process causes worse functioning of the photocatalytic heterostructures.

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### **EFFECT OF MELATONIN ACTION IN DOSE 5 MG/KG OF BODY WEIGHT ON CONTENT OF REDUCED GLUTATHIONE IN MUSCLES OF RATS WITH ALLOXAN DIABETES**

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Oxidative stress plays a key role in the development of diabetes complications, both microvascular and cardiovascular ones. Melatonin, a potent antioxidant agent, is essential for glucose homeostasis and regulation. The influence of melatonin supplementation on the oxidative stress parameters in elderly NIDDM patients has been identified.

The aim of this investigations was to determine the effect of two weeks daily melatonin injection on changes in the content of reduced glutathione in skeletal muscles of rats.

The experiments were carried out on 18 sexually mature male albino rats with the body mass – (0,18 – 0,20) kg. Alloxan diabetes was evoked via injecting the rats with a 5% solution of alloxan monohydrate intraperitoneally in a dose of 170 mg/kg of body weight (b.w.). The animals were divided into three subgroups: 1) control group; 2) diabetic rats; 3) diabetic animals which were introduced the melatonin drug intraperitoneally in a dose of 5 mg/kg of b.w. at 8 a. m. daily during 14 days starting with the 5-th 24 hour period after the injection of alloxan. Tissues of skeletal muscles were taken immediately after the decapitation of animals and used to prepare 10% homogenates on 6% sulfosalicylic acid. Determination of reduced glutathione (RG) conducted by a titration method by I.V. Meschyshen. Statistical analysis of results was conducted by Student's test. The level was considered sufficient with the probability differences  $p \leq 0,05$ .

According to the results, in the skeletal muscles of alloxan diabetic rats the content of RG was by 38% lower than in the muscles of the control group animals. The introduction of melatonin intraperitoneally in a dose of 5 mg/kg at 8 a. m. daily during 14 days to alloxan diabetic rats was conducted to increase the content of RG, that did not differ from the control rats. A decrease in RG content in skeletal muscles of alloxan diabetic rats is indicative of the reduction of glutathione system of antioxidant protection under the conditions of manifest insulin deficiency. There are some possible reasons of RG reduction during diabetes mellitus – using too much RG by glutathione-dependent enzymes. There can be disturbances in RG synthesis or reduction from its oxidized form due to deficiency of NADPH (glucose-6-phosphate dehydrogenase enzyme – main source of NADPH – activated by insulin).

Pinelectomy is well known to lead to a decreased synthesis and secretion of melatonin, which causes insulin resistance and reduces the gene expression of glucose transporter GLUT 4 in muscles.

According to the results of the study, introduction of melatonin intraperitoneally in a dose of 5 mg/kg at 8 a. m. daily during 14 days to alloxan diabetic rats is a protection against exhaustion of RG reserves in rat muscles. Positive influence of melatonin is likely to be mediated by its direct antioxidant action and activation of antioxidant enzymes.

Thus, the content of reduced glutathione in skeletal muscles of alloxan diabetic rats is decreased. The introduction of melatonin intraperitoneally in a dose of 5 mg/kg at 8 a. m. daily during 14 days to alloxan diabetic rats is conducted to normalize the content of reduced glutathione in skeletal muscles.

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### **ANISOTROPIC PHOTOLUMINESCENCE PROPERTIES OF $\text{KH}_2\text{PO}_4:\text{CdTe}/\text{CdS}$ COMPOSITE CRYSTALS**

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Recently, nanoparticles of semiconductors (quantum dots, QDs) are becoming more and more popular due to their unique electronic and optical properties. But they are synthesized in solutions, while devices where they could be



used require mainly solid state composites. Inorganic matrices, like ionic crystals, have been adopted as host materials for the encapsulation of water-soluble quantum dots.

Here, we report synthesis and the optical and structural properties of composites KDP:CdTe/CdS. CdTe/CdS nanocrystals stabilized by thioglycolic acid were synthesized in aqueous solution (molar ratio  $\text{Cd}^{2+}:\text{Te}^{2-}$  was 4:1) with emission PL colors covering green to red spectral regions. The incorporation of CdTe/CdS nanocrystals into inorganic salt of KDP was performed by the method of slow evaporation of water from a mixture of saturated salt solution and colloid of nanoparticles at the ambient condition.

Optical properties of KDP:CdTe/CdS composites were investigated by the photoluminescent spectroscopy. The PL peaks of CdTe/CdS QDs of the three different sizes cover green-to-red spectral regions and are centered at 545, 588 and 625 nm for starting solutions and at 548, 595 and 636 nm for KDP:CdTe/CdS crystals, respectively. The PL peaks are reasonably narrow (FWHM in the range of 35–45nm) in colloidal solutions, indicating the monodispersity of QDs and become only slightly wider (FWHM in the range of 40–55nm) in KDP:CdTe/CdS composite crystals. The incorporation of CdTe/CdS QDs into the crystals of KDP showed no indication of QDs aggregation.

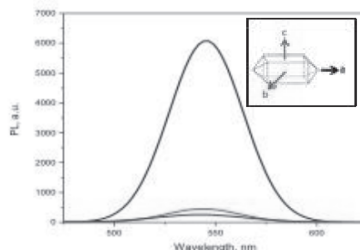


Figure. Photoluminescence spectra of KDP:CdTe/CdS measured from different orientation. The insets and colors encode directions of PL measurements

It has been determined that the CdTe/CdS nanoparticles are incorporated into the KDP crystal selectively into the surface of pyramidal face  $\{101\}$ . Strong polarization of KDP crystal surface affects the structure of the near-surface liquid layer and the adsorption kinetics of the particles. CdTe/CdS QDs are negative charged because carboxylic group of attached molecules of thioglycolic acid dissociated and negative charge are formed. So in case of negatively charged nanoparticles of CdTe/CdS the crystal-chemical parameters of the matrix lattice are interfaced with the nanoparticle and the latter can be located in the interplanar space of positively charged surface of  $\{101\}$  facets during crystal growth.

The resulted KDP:CdTe/CdS composites are a new type of solid-state conversion materials with emission colors covering green to red spectral regions. Organized distribution of nanoparticles in the KDP causes enormous dependence of PL intensity KDP:CdTe/CdS measured from different directions. Due to the larger concentration of QDs along positively charged surface of pyramidal facets  $\{101\}$ , the orthogonally excited PL intensity measured in the direction “a” is over 10 times greater than from the other directions. This effect in combination with remarkable wave-guiding properties of KDP can be applied in various applications in which lens-free light focusing is needed, for example, in luminescent solar light concentrators.

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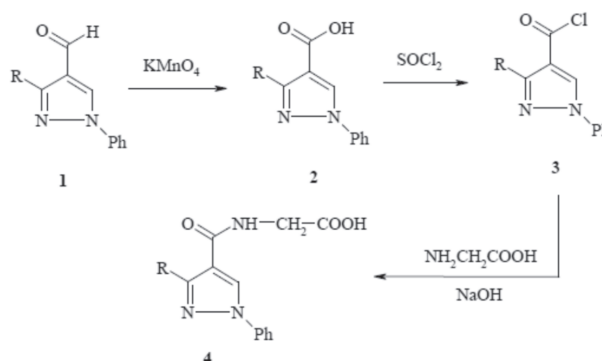
### **SYNTHESIS OF PYRAZOLE-CONTAINING AZLACTONES**

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Azlactones are convenient and promising intermediates in synthesis of a wide spectrum of acyclic and heterocyclic compounds. Continuing the research of properties of 4-pyrazolecarboxylic acids, we developed conditions of production of pyrazole-containing analogs of hippuric acid 4 using the following scheme:



R =  $\text{CH}_3$ ,  $\text{C}_6\text{H}_5$ , 4- $\text{FC}_6\text{H}_4$ , 4- $\text{ClC}_6\text{H}_4$ ;