

**МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ
БУКОВИНСЬКИЙ ДЕРЖАВНИЙ МЕДИЧНИЙ УНІВЕРСИТЕТ»**



МАТЕРІАЛИ

**104-ї підсумкової науково-практичної конференції
з міжнародною участю
професорсько-викладацького персоналу
БУКОВИНСЬКОГО ДЕРЖАВНОГО МЕДИЧНОГО УНІВЕРСИТЕТУ
06, 08, 13 лютого 2023 року**

Конференція внесена до Реєстру заходів безперервного професійного розвитку,
які проводитимуться у 2023 році №5500074

Чернівці – 2023

introduction was observed an increase in glutathione peroxidase activity by 7%, and after seven days - the level of enzyme activity increased by 23% compared to the group of animals with nephropathy. Also, in the experimental group of animals, it was observed on the 3rd day of the study the decrease in the activity of glutathione-S-transferase by 22.5%. Seven-day introduction of the antioxidant, a normalization of the activity indicators of the enzyme was observed.

Conclusions. Folic acid-induced nephropathy increases oxidative stress in the liver, as evidenced by increased formation of TBA-reactive products, decreased glutathione content, and glutathione peroxidase and glutathione-S-transferase activities. The positive effect of the seven-day use of glutathione can be due to its antioxidant, anti-inflammatory, anti-apoptotic and immunomodulatory properties. The received results regarding the effect of glutathione on the state of the oxidative-antioxidant system by kidney disease can be the theoretical basis for further study of the possibility to use glutathione for nephro- and hepatoprotective effects by kidney disease.

Kropelnytska Yu. V.

SOME SPECIFIC FEATURES OF SPECTRAL, ELECTROCHEMICAL AND ENERGY CHARACTERISTICS OF THE POLYMETHINE CATIONIC DYES-SENSITIZERS

*Department of Medical and Pharmaceutical Chemistry
Bukovinian State Medical University*

Introduction. The sensitization of semiconductors to a broader light spectral range is an important direction in the design of photosensitive semiconductors. However, the method of sensitization, which involves the direct addition of dyes to the reacting mixture, has some disadvantages. First, the adsorption of dye is comparatively weak, while its solubility in the reacting mixture is much higher. Because of that, the dye concentration in the mixture should be kept high, which makes unwanted inner light filtering more intense. This problem can be fixed by developing special heterostructures consisting of a layer of the dye-sensitizer applied to the surface of a semiconductor and protected by a special polymer film. This film doesn't put any obstacles to the interphase electron-exchange processes and prevents the dye from being washed off. Polymethine dyes are very efficient sensitizers to be used in such heterostructures and are widely used in photocatalysis and technologies for solar light conversion and accumulation.

The aim of the study. Our work was aimed at the investigation of electrochemical, spectral and energy characteristics of the cationic polymethine dyes in the context of evaluating their potential effectiveness as TiO₂ sensitizers, and developing broad photosensitivity range photocatalytic systems.

Material and methods. P25 titanium dioxide (Degussa), symmetric cationic polymethine dyes D₁-D₃, and a polymer polyepoxypropylcarbazole were used to obtain the photosensitive heterostructures. All absorption spectra of the dyes were recorded using a spectrophotometer „Oceanoptics” USB 2000+XR. Redox potentials of the polymethine dyes were measured by cyclic voltammetry using BAS 100B/W Electrochemical Workstation by Bioanalytical Systems equipped with a standard three-electrode cell. All solutions were prepared using a 0.1 M tetra-n-butylammonium tetrafluoroborate solution.

Results. The abovementioned spectral and electrochemical data were used to calculate the excitation energy required to switch a dye electron between the main and excited conditions. Since the difference between the light absorption energy and the potentials of oxidation and reduction is rather small, the proposed experimental methods can be used for the determination of the energy parameters.

The HOMO and LUMO energies were calculated from the experimentally determined oxidation and reduction potentials of the dyes. Their energy level diagrams were then built and compared with the diagram of titanium dioxide. It was found out that if the length of the polymethine chain increases by one vinylene group, a reduction in the energy gap as well as the energy required for the transition of a molecule from the main into an excited condition would decrease. As seen from the energy level diagrams, the dye oxidation potential (LUMO level) is located higher than the upper edge of the TiO₂ conductance area. Therefore, injection of electrons into the conductance area of the semiconductor is thermodynamically allowed, and these dyes can be used for the sensitization of titanium dioxide.

Conclusions. Symmetric cationic dyes D₁-D₃ were used for the first time as sensitizers of titanium dioxide. Spectral, electrochemical and energy characteristics of the dyes have been investigated and determined. Volt-ampere characteristics of the polymethine dyes have also been obtained, and their photosensitivity limits have been outlined.

Krupko O.V.

INFLUENCE OF METHYLSILICATE ACID ON OPTICAL PROPERTIES OF STABLE COLLOIDAL SOLUTIONS OF CdS/L-CYSTEINE NANOPARTICLES

Department of Medical and Pharmaceutical Chemistry

Bukovinian State Medical University

Introduction. Obtaining nanoparticles of a given size and degree of dispersion is a complicated task, the solution of which is devoted to numerous studies. In order to create the structures of the nucleus / membrane, a pharmaceutical preparation methylsilicate acid hydrogel or polymethylsiloxane (PMS) was used $(\text{CH}_3\text{SiO}_{1.5}\cdot n\text{H}_2\text{O})_\infty$. According to its medical action, it is an enterosorbent – a drug that binds exo- and endogenous substances in the gastrointestinal tract by adsorption, absorption, ion exchange and complex formation.

The aim of the study. The aim of our work is creation of heteronanostructures of the "nucleus-membrane" type based on silicon dioxide nanoparticles and a shell from nanocrystals (NC) of CdS/L-cysteine (CdS/L-Cys) semiconductors.

Materials and methods. To observe the effect of a colloidal aqueous solution of PMS on the properties of semiconductor nanoparticles, CdS solutions synthesized at pH = 7 at different temperatures were used. The absorption spectra of nanocrystals were recorded on the USB-650 spectrophotometer and the MDR-32 monochromator in the wavelength range of 350-700 nm. As a standard of comparison, a solution of L-cysteine was used.

Results. The effects of the interaction of the components of the system start to manifest themselves only 6 days after the synthesis by the appearance of an additional absorption edge in the longwave area. The displacement of the absorption edge into the longwave area and the appearance of an additional area on the absorption curve indicates the formation of larger semiconductor particles and their possible adsorption on the surface of the injected adsorbent. An increase in the PMS content naturally shifts the absorption edge to the longwave area. With an increase in PMS content by 10 times, the absorption edge has noticeably shifted to the longwave area compared to the initial solution. The assessment of the average size of nanoparticles or their aggregates absorbed by the surface of PMS particles gave a value of 6.4 nm (at a radius of 3.2 nm) after maturation for 3 hours (Fig.).

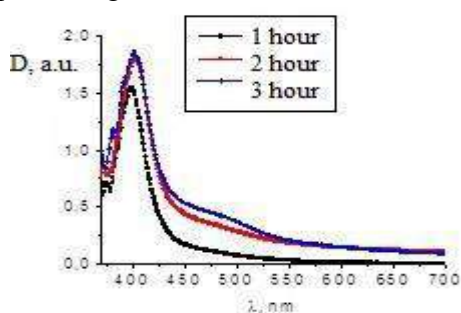


Fig. Evolution of absorption spectra of colloidal solutions of CdS/L-Cys/SiO₂ nanocrystals synthesized at pH=7 and temperature 10°C.

The study of the optical characteristics of solutions made it possible to observe the evolution of spectra associated with the adsorbing of "large" nanoparticles of a semiconductor on the surface of the adsorbent used. With time, the effect of adsorption is also observed visually by the appearance of a yellowish jelly-like precipitate at the bottom of the vessel. In this case, the solution above the precipitate is enriched with particles of small size (1-4 nm). Thus, it has been found out that PMS solution can be used for size-selective precipitation of L-cysteine-stabilized CdS nanoparticles using environmentally friendly reagents.

Conclusions. The injection of an aqueous solution of methyl silicate acid into colloidal solutions of NC CDS can stimulate both the growth of NC and the size-selective precipitation due