МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ
БУКОВИНСЬКИЙ ДЕРЖАВНИЙ МЕДИЧНИЙ УНІВЕРСИТЕТ

М А Т Е Р І А Л И

106-ї підсумкової науково-практичної конференції
з міжнародною участю
професорсько-викладацького колективу
БУКОВИНСЬКОГО ДЕРЖАВНОГО МЕДИЧНОГО УНІВЕРСИТЕТУ
03, 05, 10 лютого 2025 року

Конференція внесена до Реєстру заходів безперервного професійного розвитку, які проводитимуться у 2025 році №1005249

Чернівці – 2025

УДК 61(063)
М 34

Матеріали підсумкової 106-ї науково-практичної конференції з міжнародною участю професорсько-викладацького колективу Буковинського державного медичного університету (м. Чернівці, 03, 05, 10 лютого 2025 р.) – Чернівці: Медуніверситет, 2025. – 450 с. іл.

У збірнику представлені матеріали 106-ї науково-практичної конференції з міжнародною участю професорсько-викладацького колективу Буковинського державного медичного університету (м. Чернівці, 03, 05, 10 лютого 2025 р.) зі стилістикою та орфографією у авторській редакції. Публікації присвячені актуальним проблемам фундаментальної, теоретичної та клінічної медицини.

ISBN 978-617-519-135-4

polyepoxypropylcarbazole. The absorption spectra of dye solutions were recorded using an Oceanoptics USB 2000+XR spectrophotometer. The redox potentials of the dyes were determined by cyclic voltammetry using a BAS 100B/W Electrochemical Workstation (Bioanalytical Systems) with a standard three-electrode cell in a 0.1 M tetra-n-butylammonium tetra-fluoroborate solution.

Results. A comparison of the absorption spectra of the dye in solution and within the heterostructure shows that applying it to a solid substrate enhances association processes. On the TiO_2 surface, associates likely form excimers (J- and H-states), which is typical for this type of dye. The presence of new additional bands at shorter wavelengths than the dye monomer is indicative of this association. As a result, the ratio of narrow bands changes, broadens, and nearly merges into a single band that spans much of the visible spectrum.

Conclusions. Electrochemical studies have shown that carbocyanine dyes containing pyran fragments have an energy level higher than the conduction band of TiO_2 and can be used as sensitizers when applied to the semiconductor. This conclusion has been experimentally confirmed.

Krupko O.V.

EVOLUTION MECHANISM OF CdS/L-CYSTEIN NANOPARTICLES

Department of Medical and Pharmaceutical Chemistry,
Bukovinian State Medical University

Introduction. The study and optimization of the parameters of the synthesis of nanostructures with given properties, which are stable under the operating conditions of devices based on them, and the creation of a new class of instruments for electronics, medicine, and biology have been topical areas of research for more than a dozen years. The size, structure, and, accordingly, the optical properties of nanoparticles (NPs) can be regulated by the conditions of synthesis, the nature of the connection between the semiconductor core and the stabilizing shell of the NPs, and change over time.

The aim of the study. Is to study the mechanism of evolution of CdS/L-Cys nanoparticles in the process of growth and maturation from colloidal solutions of the composition Cd^{2+}- S^{2-}- L-Cys.

Materials and methods. High-quality starting reagents were used for the experiments, namely: 0.5 M solution of $CdCl_2 \cdot 2.5H_2O$, 0.05M solution of L-Cysteine, 0.5 M solution of $Na_2S \cdot 9H_2O$, 0.1 M solution of NaOH. A series of syntheses of CdS/L-Cys NPs was carried out at fixed pH values of 7, 9, and 11.

Results. In order to study the influence of the composition of the starting reagents on the mechanism of growth and maturation of nanoparticles, the work carried out a study of colloidal solutions of cadmium sulfide synthesized with different contents of Cd^{2+}, S^{2-} ions, and L-Cys stabilizer (solutions № 3,7,14).For colloidal solutions of NPs of semiconductors, the process of crystal growth is manifested by the shift of the maximum in the absorption spectra to the long-wavelength region and, accordingly, with the growth of the particle size (radius).

The analysis of the obtained results of the study of the optical properties of colloidal solutions of CdS/L-Sus NPs of different compositions leads to the conclusion that each solution has its own ripening time, although for some solutions the slope of the kinetic dependence is the same (solutions № 7 and 14). The size evolution (reduction) of NPs in solutions № 3 can be explained by the opposite process of agglomeration, namely, the disintegration of agglomerates into components (nuclei). It is important to take into account that in the conditions of an effective excess of sulfide ions, there is a probability of the formation of nuclei of a more "loose" hexagonal shape. Therefore, it can be assumed that the reason for the decrease in the size of NPs (dispersion) in solutions of this composition, regardless of pH (hydroxide ion content), is a change in their structure. Obviously, during the maturation of the nanocrystal, the change in its shape is determined by the desire to achieve the lowest surface energy. Similar processes probably occur in solutions with an excess of Cadmium ions (solution №7). In other solutions with a bathochromic shift of the edge of the optical absorption spectrum, the Oswald ripening mechanism of NPs appears to be the most likely.

Conclusions. From the research results, it can be concluded that the formation of NPs in the Cd^{2+}-S^{2-}-L-Cys system is described by the following schemes:

$$xCd^{2+} + 2xL\text{-}Cys \rightarrow x[Cd(L\text{-}Cys)_2]^{2+} \quad (1)$$

$$xCd(L\text{-}Cys)_2]^{2+} + xS^{2-} \rightarrow xCdS + 2xL\text{-}Cys \quad (2)$$

If pH> 7, conversion is also possible: $x[Cd(L\text{-}Cys)_2]^{2+} + 4xOH^- \rightarrow x[Cd(OH)_4]^{2-} + 2xL\text{-}Cys$ (3)

$$x\,[Cd(OH)_4]^{2-} + xS^{2-} \rightarrow xCdS + 4xOH^- \quad (4)$$

The formation of a nucleus (micelle) under the condition of an excess of Cadmium ions in an alkaline medium can be described by a general scheme:

$$nCdS + mCd^{2+} + 2xL\text{-}Cys + 2(m\text{-}2x)OH^- \rightarrow [(CdS)_n(Cd_m(L\text{-}Cys)_{2x})^{2+}](OH^-)_2 \quad (5)$$

Depending on the pH of the environment, the stabilizer L-Cysteine in an aqueous solution can exist in the form of various ionized groups, which in turn also affects the mechanism of nanoparticle evolution. When the pH of the reaction medium changes, sparingly soluble cystine can be formed, and the possibility of the interaction of stabilizer molecules with the formation of peptides according to the scheme cannot be completely excluded:

$2(SH)\text{-}CH_2\text{-}CH(NH_2)\text{-}C(O)OH \rightarrow (SH)\text{-}CH_2\text{-}CH(COOH)(NH)\text{-}(O)C\text{-}CH(NH)\text{-}CH_2\text{-}(SH) + H_2O$, (6)

which can affect the formation mechanism of CdS NPs.

Kushnir O.Yu.

THE VALUE OF PYRUVATE IN THE ENERGY METABOLISM OF RATS WITH ALLOXAN DIABETES UNDER THE CONDITIONS OF MELATONIN ADMINISTRATION

Department of bioorganic and biological chemistry and clinical biochemistry
Bukovinian State Medical University

Introduction. It is known that pyruvate is an intermediate product connecting glycolysis and the cycle of tricarboxylic acids with the subsequent formation of ATP, in addition, it can be used in the formation of essential amino acids and fatty acids. Melatonin is a hormone widely known as an antioxidant and cytoprotector. Exactly how pyruvate concentration changes under conditions of diabetes and melatonin administration is still poorly understood.

The aim of the study. To find out the effect of melatonin on the level of pyruvate in the plasma of rats with alloxan diabetes.

Materials and methods. For the experiment, 60 sexually mature outbred male rats weighing 150 grams were selected. The animals were divided into 4 groups: 1) control, 2) control + melatonin 10 mg/kg body weight, 3) alloxan diabetic rats (alloxan monohydrate intraperitoneally at the rate of 170 mg/kg body weight), 4) alloxan diabetic rats that received melatonin similarly. Fasting glucose level was determined using the One Touch Ultra Easy (Johnson & Johnson, USA). Rats were killed by decapitation under light ether anesthesia on the 12th day from the beginning of the experiment in accordance with the established norms for the treatment of experimental animals. The level of pyruvate in the blood plasma was measured according to the standard method. Statistical processing of the research results was carried out using the Student's t-test.

Results. Rats were selected for the experiment, the glucose level of which rose after the introduction of alloxan monohydrate and was 80% higher than the level of intact animals. The level of pyruvate in the blood plasma also increased by 190% compared to the intact control. Administration of melatonin caused a 37% decrease in fasting glucose and a normalization of pyruvate compared to intact controls. It is possible that melatonin has a positive effect on the regulation of pyruvate dehydrogenase gene expression. The introduction of melatonin under the conditions of the physiological norm was affected by an increase in the content of pyruvate in the plasma by 26% in comparison with the indicators of intact animals. Such results indicate the switching of energy reactions in favor of aerobic processes.

Conclusions. Pyruvate enters the processes of energy supply in rats with alloxan diabetes under the conditions of melatonin administration.