

xenobiotics. In water and in soils humic substances have been found to act as photosensitisers and they have also been reported to produce oxygen species upon irradiation, and be able to photoinduce the transformation of ecotoxicants. The photoquenching effects of humic substances on some chemicals are also known. Also, the possibility of an UV screening by humic substances on chemicals cannot be excluded since the energy-transfer and charge-transfer between the chemical and humic substances can deactivate the excited molecules. Excited singlet and triplet states of dissolved humic acids (HAs), the major component of humic substances, are important players for the transformation of organic chemical contaminants in natural waters. Our knowledge about these processes is still very limited. It was found that HAs apparently catalyzed the formation some different not toxic photoproducts of contaminants after UV-irradiation treatment by excilamps with different radiation wavelengths ($\lambda = 172, 222, 283, 308$ nm). The discussion includes comparative analysis of the direct and indirect photolysis.

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OPTICO-PHYSICAL TECHNOLOGIES OF DIAGNOSTICS OF THE BIOLOGICAL ACTIVITY OF HYDROXYL-CONTAINING AROMATIC COMPOUNDS

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System researches of optico-physical properties and the quantum-chemistry analysis of the electronic structure of biologically active organic compounds today are the actual problems of modern Life Sciences.

New types of molecules of phenols class and their analogues, benzaldehydes, and aromatic acids, which show high effect in suppressing viruses of herpes, influenza, HIV-infection, and of some other diseases, are synthesized.

Empirical correlations between the electronic structure, FTIR spectra, luminescent properties, and the pharmacological action of biologically active oxygen-containing molecules are revealed. Specific spectroscopic signs of the biological efficiency of oxygen-containing molecules are found from experiment. Formation of intramolecular hydrogen bonds in molecules under study is accompanied by the enhancement of the antiviral activity.

Quantum-chemistry calculations of the electronic structure of biomolecules have shown that there exists a direct relationship between the growth of the electronic density (ρ) of oxygen atoms of the hydroxyl O–H group and the intramolecular hydrogen O–H \cdots O=C bonding, and, as a consequence, the enhancement of the antiviral efficiency of investigated molecules.

A high reliability of the system spectroscopic analysis and quantum-chemistry calculations of biomolecules used for testing and forecasting the pharmacological efficiency of new medical products is demonstrated.

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PHOTO- AND ELECTROLUMINESCENCE OF THE SOME DISTYRYLBIPHENYLES

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Spectral properties and luminescence of four new distyrylbiphenyl's derivatives have been studied in solutions, in polyvinylcarbazole films (PVC) and in vacuum deposited films. Electroluminescence of thin layer structures has been investigated where the compounds were in PVC

or vacuum deposited films. It was shown that the luminescence spectra as under photo- and electroexcitation depends on not only molecular structure but the host nature (a solution or film). The luminescence of some compounds in films are found to belong to excimer and exciplex forms.

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VARIATION OF SPECTRA OF BLUE FLUORESCENT PROTEIN BY PHYSICOCHEMICAL FACTORS

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Discharged photoprotein obelin (protein-coelenteramide complex, product of bioluminescent reaction of marine hydroid *Obelia longissima*) is a representative of a group of "Blue Fluorescent Proteins". Discharged obelin is stable and nontoxic, its spectra are variable. It can be applied as fluorescent biomarker to visualize biomedical processes.

It is known that light-induced fluorescence spectra of discharged obelin are superposition of several components (emitters, corresponding to different fluorescent forms of coelenteramide), and their contributions can change by different factors. Here we examined fluorescence of discharged obelin under variation of excitation wavelength, time of exposure to 40 °C, concentrations of exogenous substances (alcohols). We found that higher-temperature-exposure and alcohols increase contributions of violet and decrease contributions of blue-green spectral components. The effects were explained by changes of proton transfer efficiency in the fluorescent states of coelenteramide (chromophore) in obelin under destructive influence of temperature and alcohols.

Higher-energy photoexcitation to the second absorption band (S_2^*) revealed an addition emission in red and near-infrared regions; its intensity increased under exposure to 40 °C and alcohols. The emission was hypothetically attributed to exciplex formation.

The fluorescent spectra of discharged obelin were compared to those of coelenteramide. Similarities of the spectra were reported. Quantum-chemical studies of electronic structure of coelenteramide were conducted.

B-13

BIOLUMINESCENCE: MECHANISM OF BIOLUMINESCENT REACTIONS AND THEIR ANALYTICAL APPLICATIONS

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Bioluminescence phenomenon is based on chemiluminescent enzymatic reactions transforming chemical energy to visible light with high quantum efficiency. There exist several bioluminescent reactions corresponding to several types of luminous organisms (marine bacteria, coelenterates, fireflies); they differ in chemical structure of components and enzymes. Similarities of all bioluminescent reactions are: (1) oxidative type (with molecular oxygen included) and (2) type of electronic structure of emitting molecules: emitters of the bioluminescent reactions are characterized by effective fluorescence of $\pi\pi^*$ -type and upper electron-excited states of $n\pi^*$ -type. The type of electronic structure of the emitters suggests activity of the upper states, which can be formed as primary excited states in the oxidative bioluminescent reactions. The hypothesis on activity of the upper electron-excited states in bioluminescent process was experimentally verified for bacterial and coelenterate bioluminescence.

Variation of bioluminescence color is a specific feature of coelenterate bioluminescence. It deals with chemistry in fluorescent states of the chromofore molecule (coelenteramide): several fluorescent