external characteristics for various operating modes of the generator and characters of loading: active, active and inductive and resistive-capacitive (cosφ = 0,95). Expediency of further researches on development of measures for stabilization of the external characteristic is shown.

Key words: ***autonomous power complex, agricultural machinery, synchronous generator, permanent magnets, the induced EMF, character of loading***

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THE OPTICAL ABSORPTION AND PHOSPHORESCENCE OF THE DNA MACROMOLECULE

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Annotation. *It was shown the nucleotides were practically independent absorbing centers in the DNA macromolecule. The phosphorescent measurements showed the capturing centers of triplet electronic energy excitations in the DNA are the complex like exciplex formed by neighbor adenosine (A) and thymidine (T) cells.*

Key words: ***the DNA macromolecule, Absorbing Centers, Phosphorescence, Optical Absorption***

1. Introduction

The polymeric macromolecules can be classified according their energy structure and optical properties. The knowledge of the nature and peculiarities of electronic processes in these macromolecules is necessary for their optimal and successful functional usage. The main attention of modern science is paid to π-electron containing macromolecules. Electronic properties of organic π-electron containing macromolecules are manifested in the optical wavelength range that gives the ground to apply optics spectroscopy for their electronic structure study. The biological macromolecules of the ribonucleic acids, DNA and RNA, belong to the π-electron containing macromolecules due to the presence of π-electrons in the nucleotides cells in their chains and their electronic structure can be studied by optics spectroscopy methods. Our paper

is devoted to the peculiarities of optical absorption and phosphorescent properties of the DNA macromolecule, the identification of absorbing centers and traps of the triplet electronic excitations in the DNA macromolecule.

2. Optical Absorption. The Nature of Absorbing Centers in the DNA Macromolecule

The optical absorption of the DNA were described by us in [1–5]. The optical absorption spectra of DNA (fig.1) are close to the sum (in equimolar concentrations) of corresponding nucleotides absorption spectra that is typical for organic non-conjugated π-electron containing compounds. This means that nucleotides are practically independent absorbing centers in the DNA are determined mainly by the individual properties of elementary cells – nucleotides π-electron systems. This gives us the ground to build the system energy levels of the DNA using the positions of energy levels of model compounds.

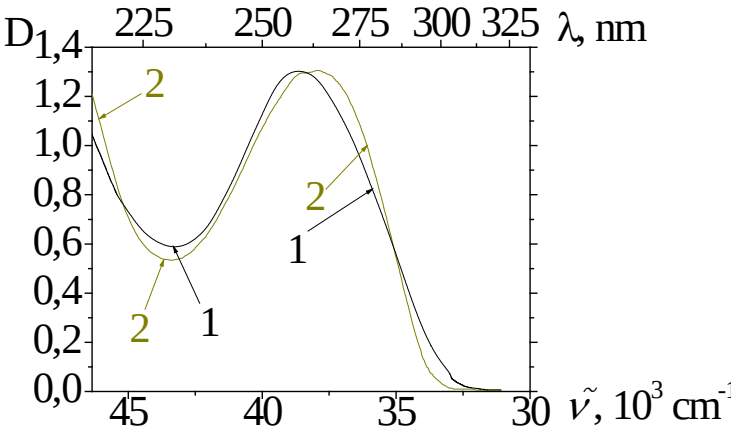

Fig. 1. The optical absorption spectra of: DNA (1) and the sum (in equimolar concentrations) of nucleotides absorption spectra – dAMP, dTMP, dGMP, dCMP (2)

3. Phosphorescence. The Nature of Capturing Centers of Triplet Electronic Excitations in the DNA Macromolecules

It was shown by us, in contrast to the absorption the phosphorescence of the DNA is not the emission of one separate nucleotide-cell. It is shown by us this is the result of the deactivation of a complex like exciplex formed between neighboring adenosine (A) and thymidine (T) cells. This was proved by comparative phosphorescence studies of a number of the compounds containing AT-sequence: the phosphorescence spectra curves of the DNA are very close to the double-stranded polymer poly(dAdT)$_2$, oligomer d(CCCGGGTTTAAA) and trimer d(ATC) correspondent spectra curves (previously investigated by us [1–3]) (fig. 2).

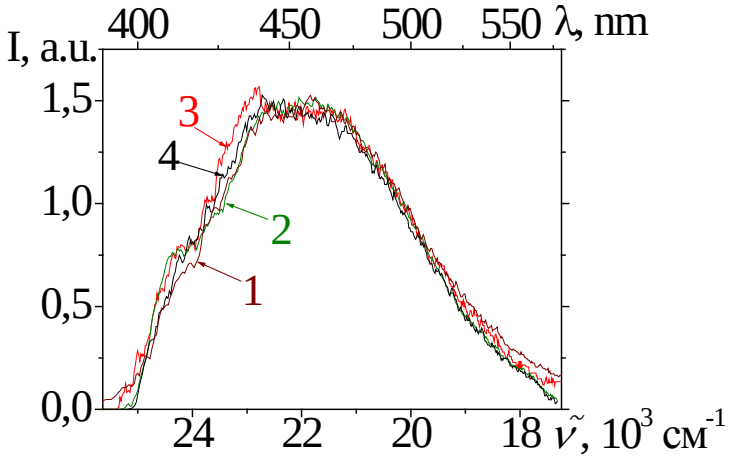

Fig. 2. The phosphorescence spectra of: DNA (1), d(CCCGGGTTTAAA) (2), poly(dAdT)$_2$ (3), and d(ATC) (4). Excitation 300 nm. Water solutions, C=10^{-4}M (T=4,2K)

Conclusions

1. The nucleotides are practically independent absorbing centers in the DNA and can be used to build the scheme of the energy levels hierarchy of this macromolecule.

2. The capturing centers of triplet electronic energy excitations in the DNA are the complex like exciplex formed by neighbor adenosine (A) and thymidine (T) cells.

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ОПТИЧНЕ ПОГЛИНАННЯ ТА ФОСФОРЕСЦЕНЦІЯ МАКРОМОЛЕКУЛ ДНК

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Анотація. *Показано, що нуклеотиди є практично незалежними центрами поглинання в макромолекулі ДНК. Вимірювання спектрів фосфоресценції, показали, що центри триплетних електронних збуджень енергії в ДНК – комплекс, сформований сусіднім аденозином (А) і комірками (Т) тимідину*

Ключові слова: ***макромолекула ДНК, центри поглинання, оптичне поглинання, фосфоресценція***

ОПТИЧЕСКОЕ ПОГЛОЩЕНИЕ И ФОСФОРЕСЦЕНЦИЯ МАКРОМОЛЕКУЛ ДНК

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Аннотация. *Показано, что нуклеотиды являются практически независимыми центрами поглощения в макромолекуле ДНК. Измерения спектров фосфоресценции показали, что центры электронных возбуждений энергии в ДНК – комплекс, сформированный соседним аденозином (А) и ячейками (Т) тимидина.*

Ключевые слова: ***макромолекула ДНК, центры поглощения, оптическое поглощение, фосфоресценция***