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ABSTRACTS

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B-4

FÖRSTER RESONANCE ENERGY TRANSFER (FRET) BETWEEN QUANTUM DOTS AND DYE IMMOBILIZED IN BIOPOLYMER PARTICLES

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The efficiency of Furster Resonance Energy Transfer (FRET) is determined by spectral characteristics of donor-acceptor pair, relative orientation of dipoles and distance between fluorophores. The dependence of FRET efficiency on the distance between donor and acceptor ($\sim 1/R^6$) allows evaluating a nanostructures size in two orders of magnitude less than fluorescence wavelength. The colloidal semiconductor quantum dots (QDs) CdTe with size of about 2.7 nm and dye (Rose Bengal) were used as a donor-acceptor pair that provides the Furster radius of up to 5 nm (distance of 50% probability of energy transfer).

The QDs and dye were incorporated into the polymer polyelectrolyte complexes (PEC), based on chitosan and chondroitin sulfate with sizes of about 300 nm in order to realize FRET. The electron microscopy showed more than one hundred QDs per one PEC content. A high local concentration of fluorophores provides distances comparable with the value of Furster radius. The FRET was registered by donor (QDs) static fluorescence quenching, by enhancement of acceptor (dye) fluorescence and donor lifetime variation The Furster model was used to determine the efficiency of energy transfer (50–60%) and the distance between fluorophores (about 4 nm). It was shown that the efficiency of energy transfer in case of incorporation of both fluorophores in the depth of particles was 30% higher than in case of external doping by dye. The results can be used for creation of sensitive optical biosensors for detection of organic analytes and minimal changes in the size of particles following the ambient medium change.

B-5

PHOTO- AND ELECTROLUMINESCENCE OF NEW ORGANIC SEMICONDUCTORS

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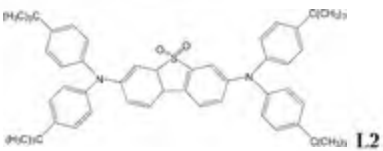
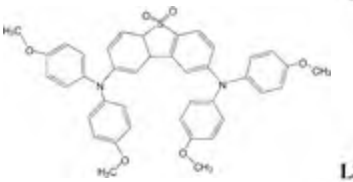
The results of investigation of the luminescence under photo- and electroexcitation for four new compounds are presented. The structure of the molecules is given below.

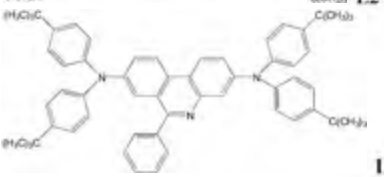
I.1



I.2



I.3



I.4

The spectral properties and photoluminescence are studied in ethanol, chloroform solutions and in films formed by thermovacuum deposition (TVD). The phosphorescence of compounds is investigated in ethanol at 77 K temperature. The phosphorescence times of molecules are given.

The electroluminescence is obtained in multilayered structure ITO/PEDOT/NPD/L /Ca/Al. It is shown, that spectral region of the photoluminescence of TVD films and electroluminescence coincide. Relations of electroluminescence efficiency with molecule structure, photoluminescence quantum yield and possibility of thermally activated delayed fluorescence are discussed.

B-6

PECULIAR WAVES IN PLANAR CONTINUOUSLY HETEROGENEOUS STRUCTURES WITH OPTICAL BIANISOTROPY

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The peculiar waves of the mixed spectrum of an inhomogeneous bianisotropic structure can be found in the form of an expansion over the complete set of waves of a discrete and continuous spectrum of a regular reference structure with the corresponding boundary conditions. It is an asymmetric planar waveguide, in which the coating and the substrate are homogeneous. The waveguide layer has tensors of dielectric and magnetic permeabilities with non-zero diagonal elements, and they depend on the transverse coordinates. Maxwell's equations were decomposed into two independent systems of quasi-differential equations for determining the transverse components of the eigenvectors of the discrete and continuous spectra.

Then we obtained equations with polynomial coefficients and they were not Fuchsian. Nevertheless, for their analytical solution we used the Frobenius' method. Thus, we found the transverse and longitudinal components of the electric and magnetic fields for the waveguide characteristics of the compositional structure. As a result, we obtained the eigenwaves corresponding to the discrete part of the spectrum whose wave numbers satisfy the dispersion equation. Their longitudinal wave number is complex (complex waves), and when the transverse wave number is imaginary, then the waves become surface waves. We found the natural waves of the continuous part of the spectrum. The wave numbers of these waves are real or imaginary and allow us to describe pseudosurface waves. Our research provides an opportunity to analyze the entire variety of waves existing in planar continuously heterogeneous structures with optical bianisotropy.

B-7

INVESTIGATION OF CHANGES IN THE OPTICAL PROPERTIES OF A COLLOIDAL SOLUTION OF SILVER NANOPARTICLES WITH THE ADDITION OF EUROPIUM IONS

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Mixed solutions containing metallic nanoparticles and ions of rare earths are used in the preparation of nanoparticles doped with rare earths, which in the near future can prove to be promising materials for photonics and nanoplasmonics. It is known that plasmon resonance is observed in silver nanoparticles, which leads to a significant increase in the local field strength and is accompanied by optical effects (amplification of luminescence, light absorption, Raman scattering, up conversion, etc.) related to "plasmonics" [1].

At present, the interaction of plasmonic effects of metallic nanoparticles and the optical properties of rare-earth metals begins [2]. In this paper we investigated the effect of the europium ions Eu^{3+} (specifically the concentration of the aqueous solution of $Eu^{3+}NO_3$) on the optical spectra of silver nanoparticles obtained by the "green" synthesis method.