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THE INVESTIGATION OF ELECTROLUMINESCEMCE OF METAL-ORGANIC ZN COMPLEXES

In this study OLED-structures were created on the base of metal-organic complexes with Zn. Also, their current-voltage, current-brightness and spectral characteristics were investigated. The ability of Zn complexes interaction with adjacent layers and the essential difference between the electron and hole conduction were observed.

Keywords: *OLED, metal-organic complex, electroluminescence.*

One of the basic types of luminescent materials are metal-organic complexes [1]. Metal-organic compounds with Zn present the particular interest [2], as well as those, which contain new ligands. High efficiency was the reason for the wide search of luminophores in this class of compounds. The presence of heavy atom in the molecule leads to a sharp increase in the spin-orbit interaction. This makes partly possible spin-forbidden radiative relaxation T1 → S0. As the result, the compound can radiate from singlet (fluorescence) and triplet (phosphorescence) levels. Theoretically, quantum yield can reach 100% [3]. There are some investigations on creating new compounds based on Zn with different ligands [4]. The feature of the metal-organic complexes with Zn is the interaction with the layers in OLED-structure with an exciplex formation. The exciplex band with its own luminescence band allows us to get white OLED [5]. In addition, complexes with Zn may replace the more expensive materials based on platinum, iridium and osmium. In connection with the above, the $Zn(DFP\text{-}SAMQ)_2$ complex electroluminescence was investigated (figure 1).

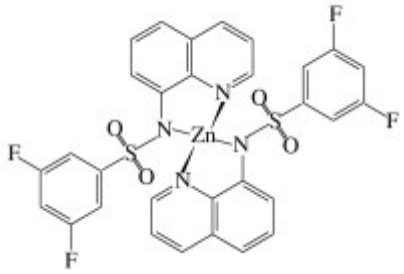

Fig. 1. Structural formula $Zn(DFP\text{-}SAMQ)_2$

Figure 2 shows the spectral characteristics of created OLED structures.

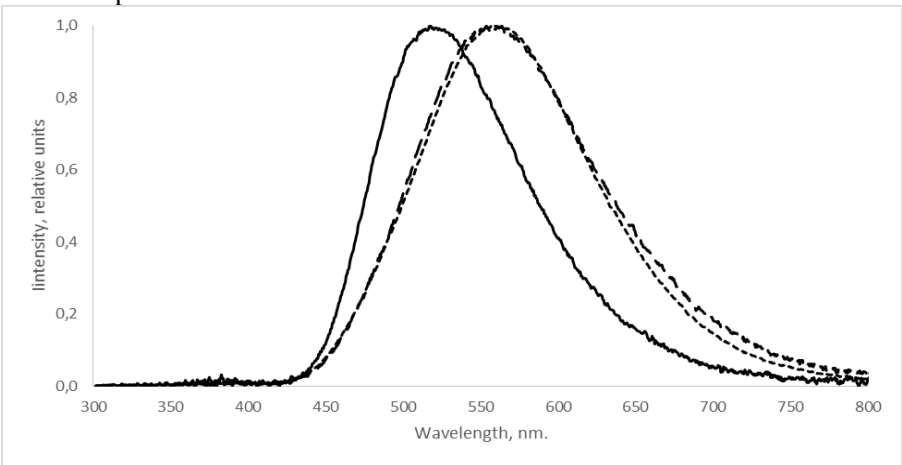

Fig. 2. Spectral characteristics of OLED structures ITO/Zn(DFP-SAMQ)2/LiF/Al (——), ITO/NPD/Zn(DFP-SAMQ)2/Ca/Al (– – –), ITO/PEDOT/NPD/Zn(DFP-SAMQ)2/LiF/Al (- - -)

Figure 2 shows that the spectrum of complex structures, is displaced to longer wavelengths relative to emission of a simple structure (anode / emission layer / cathode), it can be connected with the ability of Zn complexes to form exciplex with adjacent layers.

Figure 3 shows the current-voltage and current-brightness characteristics of metal-organic complexes with Zn.

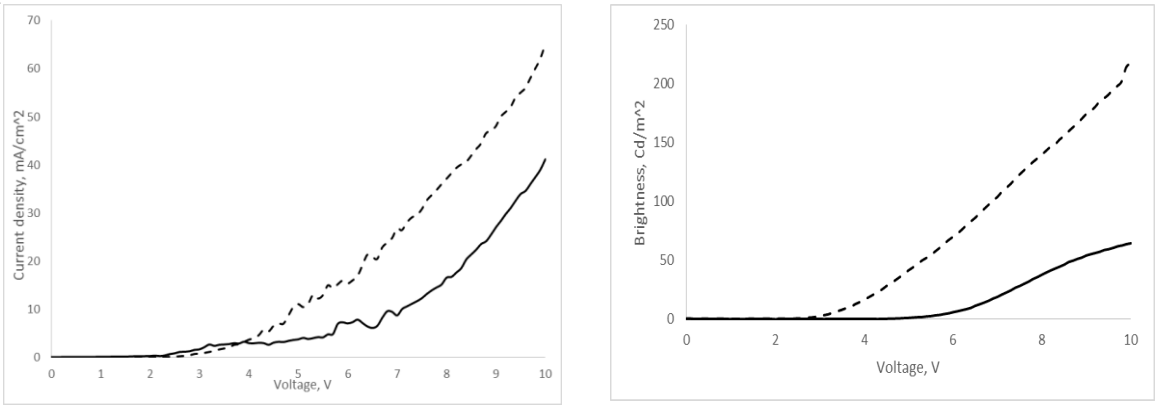

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Fig. 3. The current-voltage (a) and volt-brightness (b) characteristics of OLED structures: ITO/NPD/Zn(DFP-SAMQ)2/Ca/Al (——), ITO/PEDOT/NPD/Zn(DFP-SAMQ)2/LiF/Al (- - -)

Figure 3 shows that the addition of the hole-conductive layer (PEDOT) increases the brightness of the structure by 3 times, this indicates excessive electron-conductivity, relative to the hole in Zn complex.

As a result of this work spectral, current-voltage, current-brightness characteristics of OLED structures based on metal-organic complexes with Zn were investigated. The ability to form a complex exciplex with adjacent layers was observed, especially the displacement of the radiation spectrum at longer wavelengths. There was a significant difference between the electron and hole conduction complex. The results obtained in the paper can be used to produce OLED-structures on their basis.

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