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Influence of contacts on electroconductivity of polymer electroluminescent films doped by polymethine dyes

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Electroconductivity of ITO-polymer(dyes)-Me structures have been investigated for polyepoxypropylcarbazol doped by polymethine dyes with different ionization potential and electron affinity. Various metals (In, Sn, V, Ni, Al, etc.) were used to make contacts. Peculiarities of charge transport mechanisms and conductivity due to different dopant concentration are discussed.

Исследована электропроводность структур ITO-полимер (краситель)-металл для полиэпоксипропилкарбазола, допированного полиметиновыми красителями, имеющими различные значения потенциала ионизации и сродства к электрону. В качестве контактов использовались различные металлы (In, Sn, V, Ni, Al и др.). Обсуждаются особенности механизмов транспорта зарядов и проводимость в зависимости от концентрации допирующих добавок.

Development of organic and, in particular, polymer light-emitting elements in the visible and IR ranges is one of essential problems in the modern chemistry, molecular materials science and optoelectronics [1]. Today, it is just polyepoxypropylcarbazol (PEPC) that is among the of polymers promise for electroluminescent devices. However, the PEPC based devices have some disadvantages, for example, they emit in a restricted spectral range and their brightness is insufficient. Last years, low molecular weight organic dyes have been brought into use. In contrast to polymers, organic dyes are able to emit intensely in various spectral regions [2]. For this purpose only neutral dyes have been used so far, which are mostly derivatives of oxyquinolinolates and triphenylamines [3].

At the same time, ionic and intraionic dyes were not used for this purpose, while such type dyes can also be used as effective recombination centers [4]. Moreover, one of the main problems is how to get high injection of both types of charge carriers for high efficiency of emitting recombination. Thus, investigation of influence of contacts on electroconductivity and charge transport in polymer based structures can clarify injection properties in those. In this work, some electroconductivity peculiarities will be reported for the PEPC based structures doped with polymethine dyes.

Polyepoxypropylcarbazol was doped with various concentrations N_{PD} (0.1–4.0 %) of ionic (cationic) polymethine dyes (PD) having different length of polymethine chains [5]. The 1.10, 1.11 and 1.12 PD used had changeable $(CH{=}CH)_n$ chains with n = 1, 2 and 3, respectively. Doped PEPC films of the thickness ranging from 0.5 to 4.0 μm