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EFFECTS OF THE ANION NATURE OF CATIONIC POLYMETHINE DYES ON PHOTOVOLTAIC AND SPECTRAL-LUMINESCENT PROPERTIES OF THIN-FILM POLYMER PHOTOCONDUCTIVE COMPOSITES

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The aim of this work was to study the effects of the nature of the anion on the photovoltaic properties of film photosemiconducting composites (PCs) with a free surface, based on a photoconductive oligomer and symmetric cationic PDs with various anions. The samples were prepared on the basis of a cooligomer of glycidylcarbazole with butyl glycidyl ether (GCBE) and symmetric cationic polymethines 1–7 as shown in Figure 1. The cooligomer is characterized by hole-type conductivity and has good film forming and optical properties. Dyes 1–7 have the same chromophore (cation) and different anions in their structure: BF4-, ClO4$^-$, PF_6^- Cl$^-$, Br$^-$, I$^-$, $C_6H_4SO_3Me^-$ (Tos$^-$). The samples were prepared in the form of structures with a free surface of PC films: glass substrate/ITO/PC film, where ITO was a transparent electroconductive layer of In_2O_3:SnO_2. It has been found that the nature of the anion of cationic polymethine dyes in polymer solar cells affects phototovoltage. A study of the spectral and luminescent properties has revealed that polymethines in these samples form contact ion pairs. It has been shown that the photovoltaic properties of structures based on ionic organic dyes are determined not only by the chromophore structure, but also the nature of the counter ion. The key role here is played by the redox properties of the counterion. They are responsible for its ability for photoinduced electron transfer in ion pairs of the dyes, leading to the formation of radical species involved in photoprocesses in solar cells. These features of ionic organic dyes should be taken into consideration in the development of photovoltaic solar energy converters based on such dyes.

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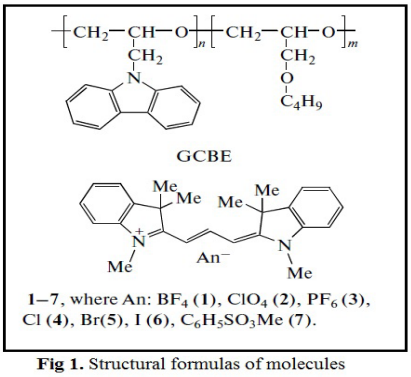

Fig 1. Structural formulas of molecules