

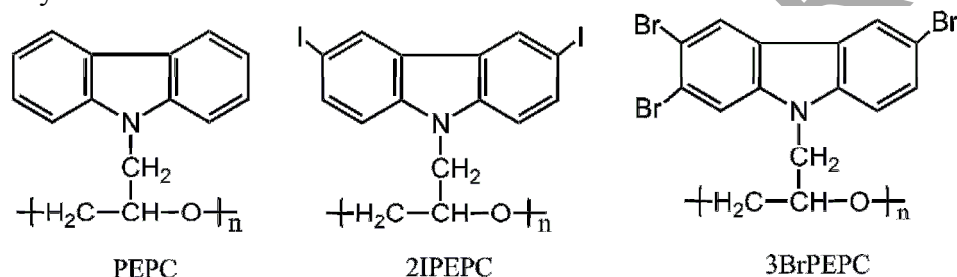
## SPECTRAL-LUMINESCENT PROPERTIES OF POLYMETHINE DYES OF DIFFERENT IONICITY, DOPED IN THE PHOTOCONDUCTIVE POLYMER MATRIX

N.Ibrayev, E.Seliverstova

*Institute of Molecular Nanophotonics, Buketov Karaganda State University, Karaganda, Kazakhstan*

Recently, solar panels based on thin organic films are referred as an alternative to solar cells based on inorganic semiconductors. Dyes are the ones of the active elements involved in the formation and recombination of electron-hole pairs in organic solar cells. Polymethine dyes, not containing a heavy atom in their compositions, have a high quantum yield in the singlet excited state and a small quantum yield into the triplet state. However, the population of the triplet state of polymethine dyes can be achieved by increasing spin-orbit interaction in the dye molecule under the influence of an external heavy atom, which is included in the structure of the polymer molecule. This will lead to the growth of the long-lived triplet dye molecules concentration and will increase the probability of electron-hole pair formation in the semiconductor polymer matrix.

This work presents the results of researching spectral-luminescent properties of a cationic (K1) and anionic (K2) polymethine dye in polymers – derivatives of poly-N-epoxypropyl carbazole with heavy atoms of different chemical nature – 2IPEPC and 3BrPEPC.



The concentration of the dye in the polymer films was equal to 1 % with respect to the weight of the polymer. The registered spectral-luminescent properties of dye molecules are presented in the table.

Table – Spectral-luminescent parameters of polymethine dyes in polymer

Polymer	PEPC	2IPEPC	2IPEPC
K1			
a $\lambda$ max, nm	561	565	562
f $\lambda$ max, nm	587	590	587
$\tau$ fl, ns	1.3	1.5	1.4
$\phi$ fl	0.05	0.02	0.02
K2			
a $\lambda$ max, nm	540	555	555
f $\lambda$ max, nm	575	580	583
$\tau$ fl, ns	1.5	1.6	1.6
$\phi$ fl	0.08	0.03	0.03

The table shows that in the polymer matrices with a heavy atom, a bathochromic shift occurs both in the absorption and in the fluorescence spectra of the dyes. In this case, a more noticeable effect is observed for the anionic dye. A noticeable quenching of the intensity, as well as the fluorescence quantum yield  $\phi$ fl, is the result of enhanced interconversion to the triplet states of the dye due to an increase in the spin – orbit interaction in the dye molecules.