Diploma thesis abstract

"Optical absorption spectroscopy of semiconducting polymer with organic acceptors"

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The effect of the threshold formation of charge-transfer complexes (CTC) in solutions of a semiconducting polymer mixed with low-molecular-weight organic acceptors was studied. The effect is that CTC concentration shows a threshold growth with increasing of acceptor concentration, which cannot be described by the standard model of CTC formation. In this work the optical absorption spectroscopy method was used.

The effect of the acceptor electron affinity on the position of the CTC absorption band was studied. It was found that a change of the electron affinity does not shift the whole CTC absorption band, but only its long-wave edge. A possible explanation is that the most intense optical transitions involve levels lying above the CTC first excited state. The position of these levels only slightly depends on the acceptor electron affinity.

The relationship between CTC formation efficiency and relative position of donor and acceptor energy levels was examined. To do this, the CTC association constant was calculated in blends of polymer MEH-PPV and a series of acceptors having different values of the electron affinity. In this series , where adjacent acceptors differ by no more than one group, it was found that the association constant increases with increasing of acceptors electron affinity.

Universality of a threshold effect was examined. The threshold effect was observed only in blends of polymer MEH-PPV and acceptor TNF previously. It was shown that the threshold effect is specifically polymer effect and it is not observed in the blends with an oligomer. A threshold effect was found in solutions of polymer MEH-PPV and a series of homomorphic to TNF acceptors. In some solutions, a threshold effect was not found; in these cases it is possible that the threshold concentrations of the acceptor were not reached.

The measurements made it possible to establish the intermolecular nature of threshold effect.