PHOTOGENERATION PROCESSES IN SEMICONDUCTIVE POLYMERIC GAMMA DETECTORS

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In paper the perspective of researches of the semi-conductor organic materials for development of gamma-detectors is considered. The processes of photo-generation of charge carriers in a molecular solid state are investigated. The role of the weak intermolecular interaction causing process of photo-generation of charge carriers through a status of the coulomb connected pair is shown. The first results of investigations of the semi-conductor polymers-silicon structures were reported. Such as of organic materials we have used oligohydroguinone, oligo-α-naphthol, oligo-β-naphthol and oligo-amino-phenylen. Current-voltage characteristics of these polymer-silicon hetero-junctions were investigated.

Gamma detectors on the basis of solid-state semi-conductor elements (*Si*, *CdTe*, etc.) have received a wide spreading all over the world. However the basic lack of these detectors - high cost of received structures. Therefore, recently scientists began to study in more detail applied aspects of perspective semi-conductor polymers with the purpose of development of the polymer gamma-detectors. Gamma sensitive polymeric semiconductors due to combination protosemiconductive properties with thermostability, mechanical and other specific properties of polymers became irreplaceable at making gamma-detectors.

The established structural regularities of change of quantum efficiency of a photoeffect in polymeric semiconductors and their molecular complexes have shown that existing classes of photosensitive materials now differ with character of interaction in mediums:

- ionic and covalent (energy of interaction E > 1eV) - in molecules of dyes and polymers;
- donor-acceptor (E = 0,05÷1 eV) - at formation by polymers of molecular complexes with low-molecular additives;
- hydrogen (E = 0,04 ÷0,2 eV) - at formation supramolecular structures.

These regularities have defined requirements to structures of molecules of complexes with high quantum efficiency of photoprocesses: donor fragments or molecules should have low potentials of ionization (<7,4 eV), and acceptor one should have high energy of electron affinity (more than 1,0 eV). The following still requirements are necessary for achievement of higher quantum efficiency of photogeneration:

1)The molecule of the donor with the specified potentials of ionization of aromatic fragments (or an acceptor with the specified electron affinity) should be polymeric with number of fragments not less than 5, and periodically located with distance between them $0{,}7.10^{-9}$ m < l < $1{,}5.10^{-9}$ m ;

2) Molecules of the donor and an acceptor, a forming molecular complex, should form polymer with the size of the monomeric link limited in thermalization radius $(1{,}5\div3{,}5).10^{-9}$ m.

The formulated requirements allow to predict limiting quantum efficiency of photoprocesses and to choose photosensitive components of molecular complexes.

Current-voltage characteristics of semiconductive polymers and of silicon-polymer gamma detectors were investigated.