

Doctoral dissertation of MSc. Anna Stefaniuk-Grams entitled "Determination of the correlation between the electrical parameters of organic photovoltaics, and the quantum efficiency of photogeneration and the transport of charge carriers" concerns research on the phenomena responsible for the photovoltaic effect in organic solar cells.

In the literature section of the dissertations, selected and basic concepts related to electron gas, inorganic conductors and semiconductors, as well as classical inorganic photovoltaic cells containing a p-n diode junction were described. Then, the specific properties of organic semiconductors resulting from the molecular structure of these materials were characterized. The properties of conductive polymers containing conjugated bonds systems and small molecule semiconductors were described on the example of selected organic semiconductors: polythiophene and fullerene derivatives. The mechanisms of the excited states formation induced by the light quanta absorption, phenomena related to the excitons diffusion in molecular crystals and amorphous solids and methods of filling of the electronic states with charge carriers have been discussed. In the further part of the doctoral dissertation, photogeneration and transport of charge carriers in organic semiconductors, with particular focus on the theoretical models of these phenomena, were described. The structure and principle of operation of organic photovoltaics with a bulk heterojunction were also discussed. In the last subsection of the literature part, selected methods for the electro-optical properties of semiconductors and photovoltaic cells testing, were listed and characterized.

In the experimental part, the properties of the investigated semiconductor materials, methods of the photoconductive and photovoltaic systems production, as well as the properties of the obtained thin layers, were described. Then, the results of investigations of the constant current characteristics in two-electrode systems containing organic semiconductors which exhibit the transport of the one type of charge carriers were discussed. Further, values of the mobility of the charge carriers of the tested semiconductors were presented and compared with the literature data. The next part presents the values of the light induced currents measured with the time of flight method in conductive polymers and with the xerographic method in the fullerene derivative with polymer mixtures. The methodology of the results analysis and a discussion on the determined parameters characterizing the tested semiconductor materials, such as mobility and photogeneration of charge carriers efficiency, were described. The modeling of the experimentally determined dependences of the charge carriers photogeneration quantum yield on the electric field intensity in the fullerene derivative, using the Onsager model, were performed. In the following part, the results of research on the photogeneration of charge carriers in naphthalene bisimide derivatives and in their mixtures with polymers, paying attention to the occurrence of the donor-acceptor interactions between the components of composites, were described. At the end of the experimental part, the results of research on the photovoltaic effect in polymers, naphthalene bisimide derivatives and their composites were presented.

In the *Summary*, an attempt was made to find a correlation between: parameters of devices containing only polymers or only naphthalene bisimides derivatives, photoconductivity of naphthalene bisimide derivatives and their mixtures with polymers, photovoltaic effect in naphthalene bisimide-polymer derivatives and mutual relations between HOMO and LUMO levels of tested organic semiconductors and electrode work function.