DESCRIPTION FOR THE GENERAL PUBLIC

Long-term forecasts indicate that society will be needed 3 times more energy in 2050 then nowadays. Therefore currently important is to take care of scientific development in the field of electricity production. As can be seen, in the last two years, the Polish photovoltaic market is characterized by a high growth rate. In 2015. there was an increase of 373% compared to 2014, but the farms installed in Poland (74 MW) are far away from the European standard, which can be regarded as normative.

The new generation of solar cells can provide environmentally friendly sourcing electricity. It is the way to ensure the effective charging electrical devices at relatively low acquisition cost of energy (e.g. for charging mobile phone or a car devices). Photovoltaic cells based on organic semiconductor materials are thin and flexible, what allow to obtain lightweight materials with variable colors. In the project, we propose the use of organic dyes or cross-cell volume, where the active layer replaces the liquid electrolyte will be placed a layer of conductive polymer material. This will lead to the improvement of the durability and efficiency of the obtained cells.

Achieving the objectives of the project will be possible by performing research tasks consisting of the design and testing of the newly developed cross organic dyes and ceramic nanocomposites in the form of nanowires occurring in combination with nanoparticle fillers and conductive polymers. Will be developed procedure of forming and testing of new photovoltaic cells dye.

The project includes the preparation of composites containing conductive phase dispersed in the form of a conductive polymer or inorganic nanoparticles ZnO, or the like of a hybrid of these fillers. Preparation of the composites provide relevant information about the influence of material composition, distribution of fillers, the size of nanoparticles and process parameters on the properties of composite materials. Synthesis of polymeric materials held by electrochemical or chemical polymerization. The project includes the preparation of composites containing conductive phase being dispersed conductive polymers (polythiophene, poly (3,4-ethylenedioxythiophene), polyaniline) or inorganic nanoparticles ZnO, or hybrids of these fillers. Collected materials will be characterized in terms necessary for the production of conductive composites. Based on the resulting composites are prepared and the fiber mats using electrospinning techniques. Will be defined technological parameters of the efficient running of the spinning process as conductivity and viscosity of the used systems. Such components may be prepared odksztacalnym substrate, which makes it possible to obtain a flexible devices, for example textiles. Obtaining nanofibers by electrospinning technique provide a large surface area needed to form a heteroj type donor - acceptor of electrons. One of the key issues undertaken within the framework of the project is to optimize the manufacturing process of one-dimensional nanostructures composite. Study the chemical structure of dyes and polymers will be performed FTIR spectroscopy. The degree of crystallinity of the ceramic composite in the form of nanoparticles, nanowires and polymers made using X-ray diffraction. For the analysis of surface topography of thin layers deposited and nanomaterials will be used atomic force microscopy. This is the basic test method for thin films and nanomaterials. Optoelectronic Properties of ceramic and polymer nanocomposite thin films, such as absorption, transmission, refractive index, extinction coefficient and the energy gap will be measured using UV / VIS and elipsometrycznie. Newly developed and used the dyes and the polymers were analyzed using the electrochemical testing technique of cyclic voltammetry. It allows you to determine the level and energy orbitals HOMO and LUMO. Will be determined current-voltage characteristics of photovoltaic cells containing coloring in its structure developed Phillips organic dyes, ceramics and polymer nanocomposite in the form of thin films, allowing the calculation of electrical describing these cells, such as short-circuit current.

Preparation of electrode for solar panels using conductive composites obtained through electrospinning expand the possibility of producing cells in the form of elastic fibers or mats, which will reduce their production costs and increase the efficiency of their work.