Nowadays, organic photovoltaic (OPV) solar cells have been very attractive technology of solar energy conversion into electrical power. The basic OPV solar cell consists of a donor-acceptor (D/A) layer, in which under solar radiation the charge carries (electron and hole) are created. The biggest problem in OPV solar cells, which inhibits the high efficiency of the photovoltaic process, is the selection of suitable active layer materials. Organic materials are important for mass production of OPV solar cell due to e.g. their low-cost manufacture. However, low value of power conversion efficiency (PCE) is still the main barrier to using them on a larger scale. Achieving good performance of OPV solar cells is possible through *inter alia* continuous investigation of new materials or modifications already known. Chemical modification of polymers allows to increase of the absorption values in the visible light range and thus to improve the optical properties and then, photovoltaic parameters.

The main aim of this proposal is designing OPV solar cells with good physicochemical parameters and high power conversion efficiency. I hope that it will be achieved by synthesis of a new group of materials with an ordered polymer chain structure. Incorporating derivatives with long alkyl chain in polymer structure or addition of self-assembly supramolecules ordered by hydrogen bond should increase conductivity, crystallinity and solubility of these copolymers. As a result, the optical and electrical properties of the copolymers used as electron donors in the active layer or the hole transport layer in the photovoltaic cell will be significantly improved and will also allow for higher PCE.

The multidirectional research will comprise the following research tasks: synthesis of copolymers and self-assembly substance, analysis of physicochemical and physicooptical properties of copolymers. The final stage will be based on construction of OPV solar cells – standard and inverted one – with typical elements and standard materials (silver, aluminum, PEDOT:PSS, zinc oxide). In this project, only the active layer will be modified. It will be combination in the bulk heterojunction manner of commercially available – [6,6]-phenyl-C_{61}-butyric acid methyl ester (PCMB) with the synthesized copolymers.