Today photovoltaics is one of many sources of electricity coming into our homes and it will be increasingly developed in the future and became the main source of energy. However, high cost and large amount of toxic waste connected with production of photovoltaic devices based on conventional semiconductor impedes spread of this source of energy. One of the most promising solutions of these problems is the use of organic materials in the construction of photovoltaic devices and one of the most promising organic photovoltaics devices are DSSC (Dye-sensitized solar cells). These cells consist of inorganic organic dye sensitized electrode, which is responsible for converting solar radiation into electricity. Despite the very high ratio of energy conversion to the cost of producing such a cell, DSSC technology still has major disadvantages. One of them is to provide a high-performance and also flexible cells, which greatly facilitate DSSC application.

One of the proposed solutions to obtain a flexible cell is to use electrodes consisting of carbon nanostructures as a replacement for today applied conductive oxides. One of the most widely developed nanostructures, both in terms of production and structures modification are carbon nanotubes CNT (ang. Carbon nanotubes). CNTs are single planes of graphite rolled-up in a tube with a diameter range of 1 nm for single-wall carbon nanotubes and for multi-walled nanotubes (when nanotubes grow into one another) reach a diameter of up to 100 nm (1 nm = 0,000000001 m). Carbon nanotubes have amazing mechanical and electrical properties. They can conduct much higher current densities than conventional conductors while maintaining the mechanical strength comparable with Kevlar. However, like most of the carbon structures, CNTs are characterized by dark colors, which mean that absorb most of the sunlight. Therefore, to apply CNTs as electrodes in photovoltaic it is necessary to produce thin film of nanostructures, which not only efficiently conduct electricity but also is transparent to visible light. A number of different methods of CNTs thin film deposition on a variety of substrates has been developed. However, Langmuir technique allows for the most precise control of deposition process. This technique consists in creating a single layer of material on the water surface. This is accomplished by pouring a solution in a volatile solvent onto air-water interface. Then the material can be mechanically compress – by precisely controlled barriers – leading to the creation of a densely packed layer. This layer can be transferred onto a substrate by emerging from water. The process for coating a substrate can be repeated several times that allows to control the thickness of the final coating with maximum possible accuracy.

Within the project we intend to produce thin layers of different types of carbon nanotubes on flexible polymer substrates using Langmuir technique. With precise control of film thickness we intend to achieve an optimal light transmission compared to electric resistance electrodes. Then electrodes will be used in the construction of model-type DSSC photovoltaic cells. Parameters of of these cells will be compared with the parameters of cells produced on glass electrodes. Furthermore, we assume that, the use of carbon nanotubes in the cells electrode will help reduce scattering and recombination of charges which is the main reason for the relatively low efficiency of DSSC. What in the future will enable the development of technology for producing flexible cells with an efficiency comparable with the commercial cells and help to implement organic photovoltaics.