Energy demand is steadily increasing and according to forecasts in 2050 it will be 2 times higher than currently. From various reports it is clear that some non-renewable energy sources will be depleted by this time. As a result, there is a growing interest in renewable energy sources, which in the future will be the basis of Earth's energy economy. However, the use of renewable energy resources often requires careful scientific and industrial analysis so that the cost of energy production was adequate to generate profits. In particular, the technology of efficient energy production remains a challenge for the 21st century. Currently, energy from solar resources is approximately 1% of total global consumption. Unfortunately, Poland in this respect is far from European standards. In order to improve the above statistics, it is crucial to design more efficient and cheaper photovoltaic cells, and this involves finding new solutions.

The current generation of photovoltaic cells face a number of problems. Among them one can distinguish the lack of anode sensitivity in the full spectrum of light radiation, weak resistance to the conditions in which the cell works, or a large mass limiting their full use (e.g. in cars). The new solutions are designed to make it possible to generate energy in an environmentally friendly way and to solve the aforementioned problems. To meet the requirements, photovoltaic cells must be thin and flexible, and hence their methods of production must reach to nanotechnology.

The scope of the project includes the production and characterization of new solar cells based on the bulk heterojunctions built from molybdenum disulphide (MoS_2) and titanium dioxide (TiO_2). The heterojunctions will be obtained by magnetron sputtering method, which will allow to obtain layers of thickness of several nanometers. TiO_2 is a cheap and common material and, in particular, resistant to external factors. Because of the poor absorption of light in the visible range, this material should be modified. For this purpose, it is proposed to combined TiO_2 with MoS_2, whose conditions of energy gap cause the material efficiently absorbs light in this range. Moreover, such bulk heterojunctions, due to their physicochemical parameters, are likely to be an efficient junctions. The obtained heterojunctions will be optimized in terms of percentage composition and thickness in order to maximize the performance of solar cells.