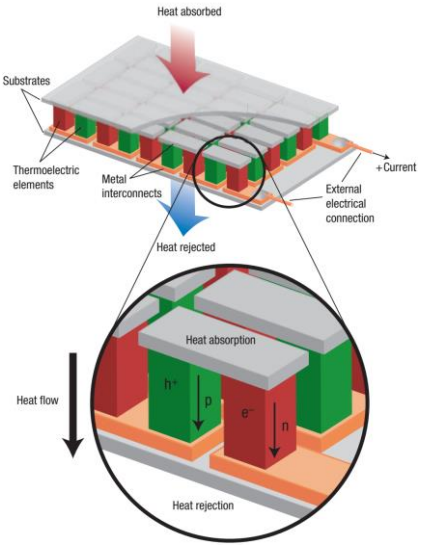
DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

(State the objective of the project, describe the research to be carried out, and present reasons for choosing the research topic - max. 1 standard type-written page)

Energy consumption in recent years increases constantly, while the resources of primary energy (e.g. oil, coal or natural gas) decrease. As a result of continued growth in the consumption of energy resources greenhouse gas emissions, as well as the cost of energy production, are increasing. In order to maintain the balance of sustainable development it is necessary to limit the use of fossil fuels and invest in sustainable renewable energy (energy efficiency and renewable energy).

One of the possibilities of using the waste-heat energy is its conversion into electricity via thermoelectric modules. The module is composed of n and p-type semiconductor elements which are connected in series through a metal electrode. The series of connected components are closed between ceramic tiles, forming the electrical insulation and base construction.



Exemplary scheme of the thermoelectric module

One of the most important application of thermoelectric modules is in space technology as a power source in radioisotope thermoelectric generators. Currently, the space mission of *Curiosity* rover, lunched to explore the surface of Mars, is powered by radioisotope thermoelectric generator built with segmented thermoelectric modules. Due to space missions progress in improvement of energy conversion efficiency of thermoelectric materials has begun. Thermoelectric modules are also used in electronics and electrical engineering for the construction of sensors, transducers and chipset cooling electronic components or in consumer refrigeration. However, technological development would not have been possible without parallel basic research on the mechanisms and phenomena determining the properties of thermoelectric materials. The scientific aim of the planned investigations is to obtain single-phase LAST and TAGS-type thermoelectric materials and composites with a much higher thermoelectric figure-of-merit *ZT* and to describe the relationship between their structure, thermal, electric, and mechanical properties, as well as fabrication conditions.

Within the scope of this project, new compositions of LAST-type (Pb/Ag/Sb/Te) and TAGS-type materials (Te/Ag/Ge/Sb), which exhibit very interesting thermoelectric properties and could be used in construction of thermoelectric generators in the future, will be produced first as powders and subsequently consolidated into bulks. It is assumed that the use of modified synthesis routes in combination with PPS and SPS (*Pulse Plasma Sintering* and *Spark Plasma Sintering*) consolidation techniques, will allow to obtain thermoelectric materials with significantly reduced thermal conductivity.

The research hypothesis of this work assumes improvement of thermoelectric parameters for materials with nanostructural modifications in comparison to materials obtained through traditional techniques of powder metallurgy.