

Providing sustainable energy to the world's population is a major societal, technical, and scientific challenge in the 21st century as the fossil fuel supplies decrease while the World's energy demand increases. Thermoelectric materials have potential applications in power generation devices that convert waste heat into electric current by the so-called Seebeck effect thus providing an alternative energy technology to reduce the dependence on traditional fossil fuels. Moreover, thermoelectric devices can be used as solid-state Peltier coolers, which do not use environmentally harmful fluids. Thermoelectric generators have the advantage of containing no moving parts, making them quiet, durable and reliable. It is only recently that advances in materials development, theory and computational tools have shown that thermoelectric devices can compete with traditional refrigeration technologies and be attractive as well for power generation.

The proposed project scope of research is novel and the implementation of the project will result in new knowledge in the field of fabrication and characterization of beyond-state-of-the-art thermoelectric materials. International collaboration with world leading thermoelectric research centres will be established. The new research group that will be formed under this project will have the opportunity to work with prominent and well-known scientists with a significant research background in the field of characterization of thermoelectric materials. Access to leading research techniques and worldwide unique Pulsed Plasma Sintering (PPS) technique will make a significant contribution to the understanding of the phenomena of thermoelectric materials based on skutterudites. Practical application of such materials with the optimized structure and a high thermoelectric performance is a huge step forward in a significant reduction of heat losses in the process of energy production and conversion. Improving the energy efficiency of these processes will bring significant environmental and economic benefits.