**DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)**

Thermoelectric materials are very common in the world. Unfortunately, to build highly efficient thermoelectric module/generator (TEM/TEG) only a narrow group of materials can be used. The main criteria describing ability of the material to work with high efficiency are Seebeck coefficient, thermal conductivity and electrical conductivity joined in *ZT* parameter. The next are mechanical strength and ability to form junction with a good quality. Nowadays there are two main ways to improve this parameters – one is optimization of the a very well-known material by nanostructurization and band gap modifications, second is search for a new one. Materials used to build TEM for low temperature applications are $Bi_2Te_3$ and $Sb_2Te_3$, which due to low thermal stability can work only to about 250 ºC. For higher temperature application there are material based on PbTe and skutterudite group like $CoSb_3$. Last years have shown that it is possible to find a new TE material like half-Heuslers alloys that possess good properties and high *ZT* in temperature range 500-700 ºC, and this is fortunately the temperature of commonly wasted heat in industry. The problem is only with their synthesis because the former elements are extremely different in atomic radius, mases and melting points. That is why the arc-melting technique is going to be used. Additionally, there would be analysed impact of the preparation process on TE properties.

**The main aim of the project is to check if there is the correlation between composition, microstructure, parameters of the arc melting process and their influence on the physicochemical properties of the obtained material. The measured properties of the samples will be compared to literature values reported by other authors and different preparation methods.**

In our proposal atoms which form intermetallic compound differ very much from each other, especially by radius and masses. It should positively influence TE properties and ability to convert energy, by decreasing thermal conductivity. To prepare these material the arc-melting method will be used. The idea of this method is based on heating over melting points of materials by the contact with high energy electrical arc (discharge). This technique allows to melt very fast materials with very high melting point, and also produce intermetallic compounds of elements with high differences in melting point temperatures.

The idea of the work is supported by the literature, where materials from group half-Heusler alloys obtained by arc-melting can exhibit desirable thermoelectric properties. Also there is possible that adding high fusible elements to materials from skutterudite group may positively influence thermoelectric properties. Especially by lowering thermal conductivity without disturbing electrical conductivity.

It's predicted, that arc-melting technique will allow to fabricate of $CoSb_3$ doped with elements having high atom mass, which should lower the heat conductivity. The chosen materials will be investigated in order to phase composition (XRD), microstructure (SEM, TEM) and physical properties (thermal conductivity, Seebeck coefficient, electrical conductivity). The results will be presented on international conference, and published in international journals.

The explanation of the raised issues will allow to explain heat transport mechanisms inside semiconductor materials. The author of the project aims to be one of a very few in the world to contribute to the development of a new research tool and method of preparation of thermoelectric materials, which cannot be produced by conventional techniques. The technique will allow to synthesize advanced semiconductor materials in a very innovative way. The development of this technology will enable researchers to discover a variety of compounds and compositions of intermetallic alloys from the perspective of thermoelectric properties.